SPACE STATION THERMAL CONTROL SURFACES

C. R. Maag
M. T. Grenier

VOLUME II - LITERATURE SEARCH

PREPARED FOR NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

CONTRACT NAS 8-32637

Report 5666
Volume II

March 1978

AEROJET ELECTROSYSTEMS COMPANY

AZUSA, CALIFORNIA

(NASA-CR-150668) SPACE STATION THERMAL CONTROL SURFACES. VOLUME 2: LITERATURE SEARCH Interim Report, 4 Aug. 1977 - 4 Feb. 1978 (Aerojet Electrosystems Co.) 410 p HC A18/MF A01 CSCL 05A G3/15

N78-22137

Unclas 15645

FOREWORD

This interim report describes results of the first six months of a study on Contract NAS 8-32637, "Space Station Thermal Control Surfaces." The contract was initiated on 4 August 1977 as a 6-month study to assess the deficiencies between the state of the art in thermal-control surface technology and that which would be required for both a 25-kW power module and a 25-year-mission space station.

The Scope of Work of the contract has been modified to include additional emphasis on Task 1, "Requirements Analysis," and the period of performance will be extended for an additional eight months of effort. The final report is being deferred until the end of the extended period of performance.

This report covers the period of 4 August 1977 to 4 February 1978, and is submitted in two volumes. The literature search and survey portion of this study are contained in Volume II.

This study was performed by personnel of Aerojet ElectroSystems Company, for the Space Sciences Laboratory of NASA-Marshall Flight Center.

Study Manager for the program was Carl R. Maag. Principal contributors to the program were C. R. Maag, J. M. Millard, and M. T. Grenier. The NASA technical monitor for the study is Mr. Donald Wilkes. Mr. Rauol Lopez acted as technical advisor for the 25-kW power module. Both Messrs. Wilkes and Lopez made significant contributions to the study through enlightening discussions with the author. Their interest and assistance are greatly appreciated.

The attached citations comprise the literature search conducted for NASA/MSFC under the "Space Station Thermal Control Surfaces Study". Four different data bases were searched. The results are presented in the following sections.

Report 5666

NASA Industrial Applications Center

77K11407 (MOD-000)NAS8-32537 150-02-01
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
AEROJET ELECTROSYSTEMS CO., AZUSA, CALIF.
DEVELOPMENT OF A THERMAL CONTROL SURFACE EXPERIMENT (TCSE)
UNCLASSIFIED JULY 11, 1977 / NOVEMBER 25, 1978
TM A/WILKES, D. R. A/ES84
REPORTS EXPECTED
/*AEROSPACE ENVIRONMENTS/*ENVIRONMENTAL TESTS/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS

76K11763 (MOD-000)NAS1-14375
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
LONG DURATION EXPOSURE FACILITY (LDEF) EXPERIMENT IMPLEMENTATION SUPPORT
UNCLASSIFIED APRIL 22, 1976 / APRIL 21, 1977
TM A/SAMOS, J. A/139A
REPORTS EXPECTED
/*AEROSPACE ENVIRONMENTS/*ENVIRONMENTAL TESTS/*GROUND TESTS/*HEAT SHIELDING/*LONG DURATION EXPOSURE FACILITY/*OXYGEN/*PHOTOGRAPHIC FILM/*PROTECTIVE COATINGS/*RADIATION EFFECTS/*RADIATION SHIELDING/*SOLAR ARRAYS/*SOLAR CELLS/*SURFACE REACTIONS/*TEMPERATURE CONTROL/*THERMAL CONTROL COATINGS/*THERMAL PROTECTION/*THICKNESS

76K11128 (MOD-005)NAS8-30636 986-25-22
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
REMTECH, INC., HUNTSVILLE, ALA.
EXTERNAL TANK SURFACE HEATING
UNCLASSIFIED MARCH 21, 1974 / AUGUST 31, 1977
PI B/ENGEL, C. D.
REPORTS EXPECTED
INCOMPLETE PROCESSING
/*ABLATIVE MATERIALS/*AERODYNAMIC HEATING/*EXTERNAL TANKS/*KINETIC HEATING/*SKIN FRICTION/*SPACE SHUTTLES/*SURFACE ROUGHNESS/*SURFACE ROUGHNESS EFFECTS/*SURFACE TEMPERATURE/*THERMAL CONTROL COATINGS/*THERMAL INSULATION/*THERMAL PROTECTION/*TURBULENT FLOW

75K10046 (MOD-000)NAS2-8490
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
ACUREX CORP., MOUNTAIN VIEW, CALIF.
DEVELOPMENT OF IMPROVED COATING FOR POLYBENZIMIDAZOLE FOAM
UNCLASSIFIED AUGUST 8, 1974 / FEBRUARY 7, 1975
PI B/CARNAHAN, K. R., B/DELANO, C.
REPORTS EXPECTED
INCOMPLETE PROCESSING
/*ALUMINUM/*COATINGS/*COMPOSITE MATERIALS/*FOAMS/*HEAT

SHIELDING/*INSULATED STRUCTURES/*INSULATION/*LOW DENSITY MATERIALS/*OPTICAL PROPERTIES/*POLYBENZIMIDAZOLE/*PROTECTIVE COATINGS/*REUSABLE HEAT SHIELDING/*SHIELDING/*SPACE SHUTTLES/*SPACECRAFT SHIELDING/*SURFACE FINISHING/*SURFACE PROPERTIES/*SYNTHETIC FIBERS/*THERMAL CONTROL COATINGS/*THERMAL INSULATICN/*THFRMAL PROTECTION

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EFFECTS OF ENVIRONMENTAL EXPOSURE ON CRYOGENIC THERMAL INSULATICN MATERIALS

(INVESTIGATION WAS MADE TO OPTIMIZE SELECTION OF INSULATION MATERIALS FOR REUSABLE SPACE VEHICLES WHICH WILL BE REPEATEDLY OPERATED OVER PERIODS OF UP TO TEN YEARS. RESULTS OF STUDY ARE SUMMARIZED IN TWO REPORTS. VOLUME I DESCRIBES TESTS AND SIGNIFICANT FINDINGS. IN VOLUME II, EXTENSIVE TEST DATA OBTAINED ARE ORGANIZED IN HANDBOOK FORM.)

A/PARMLEY, R. T.; B/SMITH, F. J.; C/GLASSFORD, A. P.; D/COLEMAN, J.; E/STEVENSON, D. R. A/(LOCKHEED MISSILES AND SPACE CO., INC.); B/(LOCKHEED MISSILES AND SPACE CO., INC.); C/(LOCKHEED MISSILES AND SPACE CO., INC.); D/(LOCKHEED MISSILES AND SPACE CO., INC.); E/(LOCKHEED MISSILES AND SPACE CO., INC.)

/*ADHESIVES/*AEROSPACE ENVIRONMENTS/*ALUMINUM/*CRYOGENIC FLUID STORAGE/*ENVIRONMENTAL TESTS/*GLASS FIBERS/*HANDBOOKS/*POLYMERIC FILMS/*SILK/*THERMAL CONTROL COATINGS/*THERMAL INSULATION

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INVESTIGATION OF ENVIRONMENTAL EFFECTS ON COATINGS FOR THERMAL CONTROL

(ACCOMPLISHMENTS MADE DURING STUDY OF COATINGS ARE REPORTED. DEVELOPMENT OF STRUCTURE/PROPERTY THEORY FOR SELECTING MOST APPROPRIATE PIGMENTS FOR SPACE VEHICLE PAINTS IS DISCUSSED ALONG WITH IMPROVEMENTS MADE IN ZINC-OXIDE PIGMENTED POTASSIUM SILICATE PAINT.)

A/ASHFORD, N. A.; B/GILLIGAN, J. E.; C/ZERLAUT, G. A. A/(IIT RES. INST.); B/(IIT RES. INST.); C/(IIT RES. INST.)

/*AEROSPACE ENVIRONMENTS/*PAINTS/*PIGMENTS/*SOLAR RADIATION/*SPACECRAFT/*THERMAL CONTROL COATINGS/*ZINC OXIDES

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A/PRINCE, D. E.

AIR FORCE MATERIALS LAB., WRIGHT-PATTERSON AFB, OHIO.

/*MILITARY SPACECRAFT/*THERMAL CONTROL COATINGS/ AEROSPACE ENVIRONMENTS/ DEGRADATION/ SPACE ENVIRONMENT SIMULATION

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/*ANALOG SIMULATION/*GAS GENERATORS/*HYDRAZINES/ RADIATION SHIELDING/ SPACE SHUTTLES/ STRESS ANALYSIS/ THERMAL CONTROL COATINGS

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IMPROVED RADIATION-STABLE THERMAL CONTROL COATINGS, PART 3 FINAL REPORT, 15 MAR. 1971 - 15 MAR. 1972
A/LILLYWHITE, M.; B/PIZZOLATO, P.; C/HARKER, R. I.
MARTIN MARIETTA CORP., DENVER, COLO.
/*AEROSPACE ENVIRONMENTS/*CERAMICS/*THERMAL CONTROL COATINGS/*THERMAL INSULATION/ ELECTROMAGNETIC SHIELDING/ OPTICAL PROPERTIES/ PERFORMANCE

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DESIGN AND CONSTRUCTION OF SAMPLE HOLDERS FOR ORBITAL TEMPERATURE CONTROL COATINGS EXPERIMENT. VOLUME 2 CALIBRATION DATA AND DRAWINGS
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SPACE TECHNOLOGY LABS., INC., REDONDO BEACH, CALIF.
/*BRACKETS/*SAMPLING/*THERMAL CONTROL COATINGS/ CALIBRATING/ DEGRADATION/ SATELLITE ORBITS/ SCIENTIFIC SATELLITES/ SPACE CAPSULES

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DESIGN AND CONSTRUCTION OF SAMPLE HOLDERS FOR ORBITAL TEMPERATURE CONTROL COATINGS EXPERIMENT. VOLUME 1 DESIGN, ANALYSIS, AND TEST RESULTS TECHNICAL DOCUMENTARY REPORT, JUN. - DEC. 1963
A/BEVANS, J. T.; B/LUEDKE, E. E.
SPACE TECHNOLOGY LABS., INC., REDONDO BEACH, CALIF.
/*BRACKETS/*SAMPLING/*THERMAL CONTROL COATINGS/ DEGRADATION/ PERFORMANCE TESTS/ SATELLITE ORBITS/ SCIENTIFIC SATELLITES/ SPACE CAPSULES

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A/EAGLES, A. E.; B/BABJAK, S., J.
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/*NUCLEAR EXPLOSIONS/*NUCLEAR WEAPONS/*THERMAL CONTROL COATINGS/ COMPUTERS/ NUCLEAR RADIATION/ SPACECRAFT/ X RAYS

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A/LEVIN, H.; B/GARDOS, M.; C/BLAIR, P. M., JR.
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/*PORCELAIN/*THERMAL CONTROL COATINGS/ HASTELLOY (TRADEMARK)/ HIGH TEMPERATURE/ SPACE SHUTTLES

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BOEING CO., SEATTLE, WASH.   (RESEARCH AND ENGINEERING DIV.)
/*SPACE SHUTTLES/*SPACECRAFT DESIGN/*THERMAL CONTROL COATINGS/*THERMAL INSULATION/ COMPUTER PROGRAMS/ HEAT TRANSFER/ THERMODYNAMIC PROPERTIES

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A/CUNNINGTON, G. R.; B/FUNAI, A. I.
LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.   (THERMOPHYSICS GROUP.)
/*EMISSIVITY/*PROTECTIVE COATINGS/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS/ ATMOSPHERIC ENTRY/ MATERIALS TESTS/ SIMULATION/ TEST EQUIPMENT/ TEST FACILITIES

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/*ABSORPTANCE/*AEROSPACE ENVIRONMENTS/*PIGMENTS/*THERMAL CONTROL COATINGS/ ELECTROMAGNETIC PROPERTIES/ OPTICAL PROPERTIES/ STABILITY

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CONCEPT DEFINITION AND SYSTEMS ANALYSIS STUDY FOR A SOLAR ELECTRIC PROPULSION STAGE. VOLUME 2, PART 1 PLANETARY SEPS MISSION ANALYSIS AND VEHICLE DESIGN   FINAL REPORT
A/HORIO, S. P.
ROCKWELL INTERNATIONAL CORP., DOWNEY, CALIF.   (SPACE DIV.)
/*INTERPLANETARY SPACECRAFT/*SOLAR ELECTRIC PROPULSION/*SPACECRAFT

DESIGN/ MISSION PLANNING/ SOLAR ARRAYS/ SPACE MISSIONS/ SPACE SHUTTLES/ SPACECRAFT LAUNCHING/ THERMAL CONTROL COATINGS/ UPPER STAGE ROCKET ENGINES

ABA AUTHOR

ABS PREFERRED PLANETARY MISSIONS FOR SEPS USING THE SHUTTLE/INTERIM UPPER STAGE LAUNCH VEHICLES ARE DESCRIBED ALONG WITH PLANETARY SEPS VEHICLE DESIGN AND SUBSYSTEM DESIGNS. EFFECTIVE ROLES OF SEPS IN EARTH ORBIT AND A REFERENCE SEPS DESIGN FOR EARTH-ORBIT MISSIONS BASED ON COST EFFECTIVE MODIFICATIONS TO THE RECOMMEND PLANETARY SEPS DESIGN ARE BRIEFLY CONSIDERED.

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STUDY OF REFLECTING SCREENS FOR THERMAL INSULATION AT HIGH TEMPERATURES --- FOR SPACE SHUTTLE GENERAL STUDIES

A/PICHOIR, R.

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/*GOLD COATINGS/*HIGH TEMPERATURE/*MICA/*SPACE SHUTTLES/*THERMAL INSULATION/ ANNEALING/ EVAPORATION/ PLATINUM/ REFLECTION/ SURFACE PROPERTIES/ THERMAL CONTROL COATINGS/ THERMAL CYCLING TESTS/ THERMAL PROTECTION

ABA ELDO

ABS RELATIVELY THIN GOLD LAYERS (0,5 MICRONS) CAN BE DEPOSITED BY AN INDUSTRIAL THERMAL EVAPORATION METHOD ON MICA TO OBTAIN REFLECTING SCREENS FOR THERMAL PROTECTION OF A SPACE SHUTTLE. THESE COATINGS RESIST WITHOUT DETERIORATING 100 THERMAL CYCLES AT 900 C, WHILE LAYERS 1 MICRON THICK WOULD BE REQUIRED AT 950 C.

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DESIGN APPLICATIONS OF RIGIDIZED REUSABLE SURFACE INSULATION THERMAL PROTECTION SYSTEM

(STRUCTURAL DESIGN CRITERIA FOR THERMAL INSULATION AND PROTECTION SYSTEM INSTALLED ON SPACE SHUTTLE VEHICLE) FINAL REPORT

A/HESS, T. E.; B/MICHALAK, R. J.

GENERAL ELECTRIC CO., PHILADELPHIA, PA. (REENTRY AND ENVIRONMENTAL SYSTEMS DIV.)

/*SPACE SHUTTLES/*SPACECRAFT COMPONENTS/*STRUCTURAL DESIGN CRITERIA/*THERMAL CONTROL COATINGS/*THERMAL INSULATION/ EQUIPMENT SPECIFICATIONS/ TEMPERATURE CONTROL/ THERMODYNAMIC PROPERTIES

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(DEVELOPMENT OF CRITERIA FOR PREDICTING BASE THERMAL ENVIRONMENT AND

BASE THERMAL PROTECTION SYSTEM DESIGN FOR LAUNCH VEHICLES)   INTERIM REPORT
A/MCANELLY, W. B.; B/HARPER, T. D.
TELEDYNE BROWN ENGINEERING, HUNTSVILLE, ALA.   (SCIENCE AND ENGINEERING.)
/*AEROTHERMODYNAMICS/*HEAT SHIELDING/*LAUNCH VEHICLES/*SPACECRAFT DESIGN/ AEROSPACE ENVIRONMENTS/ THERMAL CONTROL COATINGS/ THERMAL ENVIRONMENTS

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PRELIMINARY STUDY OF RADIATORS AND RADIATOR INTERFACES FOR THE SPACE BASE
(CONCEPTUAL DESIGN OF SPACE BASE ENVIRONMENTAL THERMAL CONTROL AND LIFE SUPPORT SYSTEM RADIATORS)
A/OREN, J. A.; B/DIETZ, J. B.; C/TUFTE, R. J.
LTV AEROSPACE CORP., DALLAS, TEX.   (MISSILES AND SPACE DIV.)
/*ENVIRONMENTAL CONTROL/*LIFE SUPPORT SYSTEMS/*SPACE BASES/*SPACECRAFT RADIATORS/*SYSTEMS ENGINEERING/ HEAT TRANSFER/ MODULES/ TEMPERATURE CONTROL/ THERMAL CONTROL COATINGS

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A/GREENBERG, S. A.; B/MC CARGO, M.; C/MC DONALD, S. L.; D/SPRADLEY, L. W.
LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.   (PROPULSION AND THERMODYNAMICS DIV.)
/*AEROSPACE ENVIRONMENTS/*CONTAMINATION/*DEGRADATION/*SPACE STATIONS/*SYSTEMS ENGINEERING/*THERMAL CONTROL COATINGS/ THERMAL PROTECTION/ THERMODYNAMIC PROPERTIES

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REPORT ON SELECTED UPDATE TASKS FOR BASELINE SPACE STATION. VOLUME 2 - THERMAL CONTROL
(THERMAL ANALYSIS OF SPACE STATION ENVIRONMENTAL CONTROL, LIFE SUPPORT SYSTEM, AND ELECTRICAL POWER SYSTEM RADIATORS - VOL. 2)
MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON BEACH, CALIF.
/*ENVIRONMENTAL CONTROL/*HEAT RADIATORS/*LIFE SUPPORT SYSTEMS/*SPACE STATIONS/*SPACECRAFT POWER SUPPLIES/*THERMAL PROTECTION/ ABSORPTIVITY/ BRAYTON CYCLE/ SPACECRAFT MODULES/ THERMAL CONTROL COATINGS

75W70258 506-16-32
THERMAL CONTROL-SECOND SURFACE MIRRORS
BROOKS, G. W. 804-827-2042
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.

AN EXPERIMENTAL PROGRAM IS IN PROGRESS TO DEFINE, STUDY, AND SOLVE THE PROBLEMS ASSOCIATED WITH UTILIZATION OF SECOND-SURFACE MIRROR COATINGS FOR PASSIVE THERMAL CONTROL OF SPACECRAFT. THE DEVELOPMENT OF THE TECHNOLOGY NECESSARY TO ECONOMICALLY UTILIZE SECOND-SURFACE MIRROR COATINGS ON LARGE SPACECRAFT SURFACES WILL BE EMPHASIZED. EXPERIMENTAL AROMATIC-HETEROCYCLIC POLYMERS WILL BE EVALUATED TO PROVIDE IMPROVED RADIATION STABILITY FOR THE SECOND-SURFACE MIRROR COATINGS. THE APPROACH SHALL INCLUDE (1) UNDERSTANDING THE PRINCIPLES OF SECOND-SURFACE MIRRORS, DETERMINING THE MATERIALS TO BE EMPLOYED, AND DEVELOPING COMPLETE COATING SYSTEMS AND PROCEDURES FOR THEIR APPLICATION TO SPACECRAFT, AND (2) THE CONTINUED USE OF THE SPACE ENVIRONMENTAL EFFECTS SYSTEM FACILITY TO EVALUATE THE RADIATION STABILITY OF THERMAL CONTROL COATINGS.

/*HEAT PIPES/*MATERIALS TESTS/*POLYMERS/*SPACECRAFT/*THERMAL CONTROL COATINGS

74W70260 502-21-27
THERMAL CONTROL
BROOKS, G. W. 703-827-2042
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.

AN EXPERIMENTAL PROGRAM IS IN PROGRESS TO DEFINE, STUDY, AND SOLVE THE PROBLEMS ASSOCIATED WITH UTILIZATION OF SECOND-SURFACE MIRROR COATINGS FOR PASSIVE THERMAL CONTROL OF SPACECRAFT. THE DEVELOPMENT OF THE TECHNOLOGY NECESSARY TO ECONOMICALLY UTILIZE SECOND-SURFACE MIRROR COATINGS ON LARGE SPACECRAFT SURFACES WILL BE EMPHASIZED. EXPERIMENTAL AROMATIC-HETEROCYCLIC POLYMERS WILL BE EVALUATED TO PROVIDE IMPROVED RADIATION STABILITY FOR THE SECOND-SURFACE MIRROR COATINGS. THE APPROACH SHALL INCLUDE (1) UNDERSTANDING THE PRINCIPLES OF SECOND-SURFACE MIRRORS, DETERMINING THE MATERIALS TO BE EMPLOYED, AND DEVELOPING COMPLETE COATING SYSTEMS AND PROCEDURES FOR THEIR APPLICATION TO SPACECRAFT; AND (2) THE CONTINUED USE OF THE SPACE ENVIRONMENTAL EFFECTS SYSTEM FACILITY TO EVALUATE THE RADIATION STABILITY OF THERMAL CONTROL COATINGS.

/*AEROSPACE ENVIRONMENTS/*MIRRORS/*POLYMERS/*RADIATION SHIELDING/*THERMAL CONTROL COATINGS

74W70259 502-21-27
THERMAL CONTROL
GATES, D. W. 205-453-3102
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

AS A CONTINUATION OF WORK IN THE THERMAL-CONTROL COATINGS FIELD, OUR EFFORTS WILL BE DIRECTED TOWARD METHODS OF IMPROVING NASA'S CAPABILITIES OF CONTROLLING SPACECRAFT TEMPERATURES. EFFORT WILL BE DIRECTED TOWARD IMPROVEMENT OF THE WHITE PAINTS AND THEIR RELIABILITY FOR EXTENDED MISSION REQUIREMENTS. WHILE MAINTAINING THE 0.9 EPSILON

REQUIRED IN THE PRESENT THERMAL DESIGNS FOR SPACE STATION, THE DELTA ALPHA MUST BE A MINIMUM TO OBTAIN THE REQUIRED TOTAL LIFE OR THE LEAST EVA REQUIRED TO RESTORE THE THERMAL-CONTROL SURFACES. THIS IS BEING DONE BY IMPROVING BOTH BINDERS AND PIGMENTS, AND PROTECTION OF THE COATING AFTER APPLICATION, TO ITS EVENTUAL MISSION REQUIREMENT. BACKUP KNOWLEDGE FOR THESE DEVELOPMENT EFFORTS WILL INCLUDE LABORATORY STUDIES OF COATINGS, MEASUREMENT DESIGN PARAMETER DATA AND LONG LIFETIMES OF COATINGS AND THEIR SUBSTRATES AT CRYOGENIC TEMPERATURES. MAXIMUM EFFORT WILL BE TOWARD REDUCING THE PRESENT BEST WHITE PAINT, COMPOSED OF ZNETIO4 PIGMENT IN AN OI-650 GLASS-RESIN BINDER, TO A NASA SPECIFICATION COATING.

/*PIGMENTS/*SERVICE LIFE/*SPACE STATIONS/*SPACECRAFT ENVIRONMENTS/*TEMPERATURE CONTROL/*THERMAL CONTROL COATINGS

73W70747 909-42-02
SPACE SHUTTLE THERMAL CONTROL
SMITH, J. A. 713-483-3676
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.

THE OVERALL VEHICLE THERMAL MANAGEMENT SYSTEMS FOR THE SHUTTLE MUST BE FLEXIBLE AND ADAPTABLE ENOUGH TO ACCOMODATE CHANGES IN MISSIONS AND CONFIGURATIONS AND MUST EFFICIENTLY UTILIZE AVAILABLE HEAT SOURCES AND SINKS. THE MULTI-MISSION REQUIREMENT FOR THE SHUTTLE PRESENTS PARTICULAR DESIGN PROBLEMS IN THERMAL CONTROL DUE TO (1) LIFE-CYCLE CONSIDERATIONS, AND (2) THE WIDE RANGE OF REQUIRED OPERATING CONDITIONS VARYING FROM THOSE SIMILAR TO CONVENTIONAL AIRCRAFT, TO SPACECRAFTS SUBJECTED TO BOOST, ORBITAL AND REENTRY THERMAL CONDITIONS. THE OBJECTIVE OF THIS RTOP IS TO DEVELOP CANDIDATE THERMAL CONTROL CONCEPTS WHICH OFFER POTENTIAL SOLUTIONS FOR SHUTTLE DESIGN PROBLEMS AND DEVELOP IMPROVED ANALYTICAL TECHNIQUES FOR MORE EFFECTIVE DESIGN AND EVALUATION. HEAT PIPE THERMAL CONTROL SYSTEMS OFFER THE POTENTIAL FOR LONG LIFE AND TROUBLE FREE HEAT TRANSPORT AND REJECTION AT LOW WEIGHTS FOR SPACE SHUTTLE EQUIPMENT COOLING APPLICATIONS. DESIGN AND TESTING OF PROTOTYPE THERMAL CONTROL SYSTEMS APPLICABLE TO THE UNIQUE SPACE SHUTTLE ENVIRONMENT AND REUSE APPLICATIONS WILL BE PURSUED TO PROVIDE THERMAL CONTROL DESIGN OPTIONS FOR THE SHUTTLE VEHICLE. VEHICLE COMPLEXITY AND USE OF ADVANCED COMPONENTS REQUIRES IMPROVED ANALYTICAL METHODS AND EXTENSIVE VEHICLE LEVEL ANALYSIS FOR DESIGN SUPPORT AND MISSION PLANNING. THE ANALYTICAL TECHNIQUES DEVELOPMENT PROGRAM IS DIRECTED TOWARDS DEVELOPING COMPUTER PROGRAMS FOR USE AS ANALYTICAL TOOLS FOR THE SHUTTLE PROGRAM.

/*COMPUTER PROGRAMS/*HEAT PIPES/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS/*THERMAL PROTECTION

72W70118 114-03-51
SPACE STATION THERMAL CONTROL
GATES, D. W. 205-453-3100
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

AS A CONTINUATION OF OUR WORK IN THE THERMAL CONTROL FIELD, OUR EFFORTS WILL BE DIRECTED TOWARD SEVERAL METHODS OF IMPROVING NASA'S CAPABILITIES OF CONTROLLING SPACECRAFT TEMPERATURES. ONE EFFORT WILL

_BE DIRECTED TOWARD IMPROVEMENT OF THE WHITE PAINTS AND THEIR RELIABILITY FOR EXTENDED MISSION REQUIREMENTS. WHILE MAINTAINING THE 0.9 REQUIRED IN THE PRESENT THERMAL DESIGNS FOR SPACE STATION, THE DELTA A _SUB S MUST BE A MINIMUM TO OBTAIN THE REQUIRED TOTAL LIFE OR THE LEAST EVA REQUIRED TO RESTORE THE THERMAL-CONTROL SURFACES. THIS IS BEING DONE BY IMPROVING THE BINDERS AND PIGMENTS, AND PROTECTION OF THE _COATING AFTER APPLICATICN, TO ITS EVENTUAL MISSION REQUIREMENT. INTEGRATION OF EFFICIENT HEAT PIPES INTO ELECTRONIC AND ELECTROMECHANICAL HARDWARE IS BEING DEVELOPED FOR THERMAL CONTROL NECESSARY FOR EXTENDED LIFE OF THESE COMPONENTS. THIS IS NOT BROAD COVERAGE OF HEAT PIPE APPLICATIONS, ONLY THE SPECIFIC USE. DEVELOPMENT OF LARGE SCALE THIN FILM SEMICONDUCTORS IS PROPOSED FOR THERMAL CONTROL DEVICES WITH LCNG LIFE AND FLEXIBLE CONTROL OF SURFACE AND INTERIOR SURFACES. IN ORDER TO PROVIDE NECESSARY BACKUP KNOWLEDGE FOR THESE DEVELOPMENT EFFORTS, LABORATORY STUDIES OF COATINGS, HEAT PIPES AND SEMICONDUCTORS WILL CONTINUE, AND SPECIAL EFFORT IS NOW DIRECTED TOWARD MEASUREMENT DESIGN PARAMETER DATA (THERMAL CONDUCTIVITY, RESISTIVITY AND RADIATION _FIELD VARIATION FOR THE SEMICONDUCTORS), MINIATURE HEAT PIPE ANALYSIS, AND PROPERTIES AND LONG LIFE TIMES OF COATINGS AND THEIR SUBSTRATES AT CRYOGENIC TEMPERATURES.

/*TEMPERATURE CONTROL/*SPACE STATIONS/*THERMAL CONTROL COATINGS/*HEAT PIPES/*SEMICONDUCTING FILMS/*LIFE (DURABILITY)

72W70113 114-03-50

SPACE VEHICLE THERMAL CONTROL

BROOKS, G. W. 703-827-2042

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.

A COMPREHENSIVE EXPERIMENTAL AND THEORETICAL PROGRAM IS IN PROGRESS TO DEFINE, STUDY, AND SOLVE ADVANCED TECHNOLOGY PROBLEMS ASSOCIATED WITH PASSIVE THERMAL CONTROL OF UNMANNED SPACECRAFT. THE DEVELOPMENT OF FLEXIBLE, SECOND-SURFACE MIRROR COATINGS WILL CONTINUE WITH EMPHASIS ON THE UTILIZATION OF NEW, EXPERIMENTAL POLYMERIC MATERIALS. RESEARCH IN ADVANCED THERMAL CONTROL TECHNIQUES (E.G., PASSIVE ENCLOSURES, VAPOR CHAMBERS) WILL CONTINUE WITH EMPHASIS ON APPLICATION OF THESE TECHNIQUES TO A LARGE ORBITING OBSERVATORY. THIS RESEARCH IS DIRECTED AT PROVIDING THE TECHNOLOGY FOR FUTURE LONG-LIFE EARTH ORBITAL _AND INTERPLANETARY MISSIONS. THE POLYMERIC COATING MATERIALS WILL BE EVALUATED TO DETERMINE THE EFFECTS OF VACUUM, TEMPERATURE, ULTRAVIOLET RADIATION, AND SOLAR WIND PLASMA RADIATION ON THEIR OPTICAL PROPERTIES. THESE DATA WILL BE UTILIZED TO PROVIDE SELECTION CRITERIA FOR DEVELOPMENT OF SPACE-STABLE, TRANSPARENT POLYMERIC FILMS FOR SECOND-SURFACE MIRROR COATINGS. SEVERAL DIFFERENT PASSIVE ENCLOSURES FOR THE ORBITING TELESCOPE WILL BE DESIGNED AND EVALUATED IN A SIMULATED ORBITAL THERMAL ENVIRONMENT. THESE RESULTS WILL BE USED WITH ANALYTICAL STUDIES TO PROVIDE THE BASIC DESIGN FOR THERMAL CONTROL OF THE LARGE ORBITING TELESCOPE STRUCTURE AND PRIMARY MIRROR.

/*SPACE LABORATORIES/*TEMPERATURE CONTRCL/*POLYMERIC FILMS/*THERMAL CONTROL COATINGS/*ASTRONOMICAL TELESCOPES/*MIRRORS

72W70100 114-03-07
OPTICAL CONTAMINATION OF SPACECRAFT
WEATHERS, H. M. 205-453-3040
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
THIS STUDY IS DIRECTED TOWARD A BETTER UNDERSTANDING OF THE INDUCED ENVIRONMENT AROUND SPACECRAFT, BOTH MANNED AND UNMANNED AS IT DEGRADES THE RESULTS OF IMPORTANT MEASUREMENTS AND EXPERIMENTS. MOREOVER, THIS RTOP PROVIDES FOR THE STUDY, CONTROL, MONITORING, AND ABATEMENT OF CONTAMINATION AS IT EFFECTS ASTRONOMICAL INSTRUMENTS, THERMAL CONTROL SURFACES, AND OTHER CRITICAL OPTICAL SURFACES SUCH AS FOUND ON SKYLAB, HEAO, SPACE STATION, SPACE SHUTTLE, AND RAM.
/*SPACECRAFT CONTAMINATION/*DEGRADATION/*THERMAL CONTROL COATINGS/*AEROSPACE ENVIRONMENTS/*OPTICAL EQUIPMENT

77A19496# ISSUE 7 PAGE 991 CATEGORY 18 ASME PAPER 76-ENAS-55 76/07/00 9 PAGES UNCLASSIFIED DOCUMENT
THE EFFECT OF RADIATION TRAPPING WITHIN THE SPECULAR CAVITY FORMED BY THE SHUTTLE FORWARD RADIATORS AND PAYLOAD BAY DOOR
A/SCHEPS, P. R.; B/HOWELL, H. R. B/(VOUGHT CORP., SYSTEMS DIV., DALLAS, TEX.) MEMBERS, $1.50; NONMEMBERS, $3.00
AMERICAN SOCIETY OF MECHANICAL ENGINEERS, INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN DIEGO, CALIF., JULY 12-15, 1976, 9 P.
/*BAYS (STRUCTURAL UNITS)/*DOORS/*RADIATION EFFECTS/*SPACE SHUTTLE ORBITERS/*SPACECRAFT DESIGN/*SPACECRAFT RADIATORS/*THERMAL CONTROL COATINGS/ CAVITIES/ DIFFUSE RADIATION/ ISOTHERMAL PROCESSES/ RADIATIVE HEAT TRANSFER/ SILVER/ SPECULAR REFLECTION/ TEFLON (TRADEMARK)
ABA G.R.
ABS THE RADIATORS USED FOR SPACE SHUTTLE ORBITER ON-ORBIT HEAT REJECTION MUST CONFORM TO THE SHAPE OF THE PAYLOAD BAY DOORS IN CONNECTION WITH MISSION DESIGN PLANS WHICH ENVISAGE A STORAGE OF THE RADIATORS IN THE PAYLOAD BAY DURING LAUNCH AND REENTRY AND A DEPLOYMENT OF THE RADIATORS IN ORBIT. AN INVESTIGATION WAS CONDUCTED TO FIND SOLUTIONS TO SEVERAL THERMAL DESIGN AND ANALYSIS PROBLEMS RELATED TO THE FORWARD PANEL/DOOR CROSS SECTION. DATA CONCERNING THE BASIC RADIATION PROPERTIES OF THE RADIATOR/DOOR CAVITY WERE OBTAINED IN A TEST PROGRAM ON A FULL-SCALE RADIATOR/DOOR SEGMENT. THE PROGRAM PROVIDED FUNDAMENTAL DATA ON THE RADIATION EXCHANGE FACTORS BETWEEN SURFACES WITHIN THE SPECULAR CAVITY FORMED BY THE RADIATOR AND DOOR, WHICH IS INDEPENDENT OF THE RADIATOR TUBE DESIGN. IT IS POINTED OUT THAT IMPROVED METHODS FOR CALCULATING ENVIRONMENTAL FLUXES ARE REQUIRED BECAUSE OF RADIATION TRAPPING WITHIN THE DOOR/PANEL CAVITY.

77A11547 ISSUE 1 PAGE 13 CATEGORY 15 76/11/08 4 PAGES UNCLASSIFIED DOCUMENT
POST-FLIGHT TURNAROUND STILL UNSETTLED --- SPACE SHUTTLE REFURBISHMENT TIME BETWEEN MISSIONS
AVIATION WEEK AND SPACE TECHNOLOGY, VOL. 105, NOV. 8, 1976, P. 128, 129, 131, 133.
/*MISSION PLANNING/*POSTFLIGHT ANALYSIS/*REGENERATION (ENGINEERING)/*SPACE SHUTTLES/ FLIGHT TESTS/ OPTIMIZATION/ PAYLOADS/ PROPELLANT TANKS/ THERMAL CONTROL COATINGS

ABA R.D.V.
ABS PROGRESS IN PLANS FOR KEEPING SHUTTLE TURNAROUND AND REFURBISHMENT CYCLES WITHIN PRESET TIME BOUNDS IN THE FIRST SIX ORBITAL FLIGHT TEST INITIAL MISSIONS IS REPORTED. PAYLOAD KIT TURNAROUND TIME IS DEEMED 'CRITICAL,' TASKS HOLDING UP TURNAROUND, TIME MINIMIZATION AND REFURBISHMENT SCHEDULES ARE LISTED. THE GOAL IS 160 HR TURNAROUND TIME STRETCHABLE TO 230 HR BEFORE LAUNCH SCHEDULES WOULD BE THROWN OFF (ASSUMING ABOUT 40 LAUNCHES A YEAR). CHANGEOUT OF PAYLOAD ACCOMMODATION KITS, PAYLOAD KIT REMOVAL TIME, AND REFURBISHMENT TIME SEGMENTS ARE CHARACTERIZED, WITH TIMELINES FOR THE CRYOGENIC TANK KIT, DOCKING MODULE KIT, EJECTION SEAT KIT, AND VARYING PAYLOAD KITS THE MAIN PROBLEMS, WHILE REFURBISHMENT OF THE THERMAL PROTECTION SYSTEM COATINGS IS A PARAMOUNT SEGMENT OF THE REFURBISHMENT CYCLE. SOME OTHER LAUNCH PAD TURNAROUND OPERATIONS THAT MAY UPSET PRELIMINARY TURNAROUND TIMELINES ARE LISTED.

77A11540 ISSUE 1 PAGE 17 CATEGORY 18 76/11/08 3 PAGES
UNCLASSIFIED DOCUMENT
THERMAL TILE PRODUCTION READY TO ROLL --- FOR SHUTTLE ORBITER ABLATIVE HEAT SHIELDING
A/OLONE, R. G.
AVIATION WEEK AND SPACE TECHNOLOGY, VOL. 105, NOV. 8, 1976, P. 51, 53, 54.
/*ABLATIVE MATERIALS/*BOROSILICATE GLASS/*HEAT SHIELDING/*PRODUCTION ENGINEERING/*SPACE SHUTTLE ORBITERS/*THERMAL CONTROL COATINGS/ ABLATIVE NOSE CONES/ LEADING EDGES/ REENTRY SHIELDING/ STRUCTURAL WEIGHT/ THERMAL PROTECTION/ TILES
ABA R.D.V.
ABS MANUFACTURING AND PRODUCTION OF THE TILES FORMING THE ABLATIVE HEAT SHIELD OF SHUTTLE ORBITER ARE OUTLINED. PROBLEMS IN THE PRODUCTION, SHAPING, AND DIMENSIONING OF THE 34,000 UNIQUE TILES IN THE THERMAL PROTECTION SYSTEM OF EACH ORBITER ARE DISCUSSED. DEVELOPMENT OF THE REACTION-CURED GLASS (RCG) TILE COATING, MEASURES TO ENSURE PROVISIONING OF HIGH-PURITY SILICA, AND MATERIALS REQUIREMENTS FOR THE LOWER-TEMPERATURE AND ELEVATED-TEMPERATURE TILES ARE COVERED. TECHNOLOGICAL COMPLEXITIES IN NUMERICALLY CONTROLLED (NC) MILLING OF THOUSANDS OF UNIQUE TILES, AND COSTS ASSOCIATED WITH NC TAPE QUANTITY ZERO-DEFECT CUSTOM PRODUCTION RUNS, ARE SKETCHED.

76A37690*# ISSUE 18 PAGE 2789 CATEGORY 18 AIAA PAPER 76-444
76/07/00 9 PAGES UNCLASSIFIED DOCUMENT
EFFECT OF RADIANT AND CONVECTIVE HEATING ON THE OPTICAL AND THERMOCHEMICAL PROPERTIES OF REUSABLE SURFACE INSULATION --- FOR SPACE SHUTTLE THERMAL CONTROL
A/STEWART, D. A.; B/LEISER, D. B. B/(NASA, AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.)
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, THERMOPHYSICS CONFERENCE, 11TH, SAN DIEGO, CALIF., JULY 14-16, 1976, 9 P.
/*CONVECTIVE HEAT TRANSFER/*OPTICAL PROPERTIES/*RADIANT HEATING/*REUSABLE HEAT SHIELDING/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS/*THERMOCHEMICAL PROPERTIES/ ABSORPTIVITY/ DATA ACQUISITION/ MATERIALS TESTS/ PHOTOMICROGRAPHY/ SOLAR ENERGY ABSORBERS/ X RAY

FLUORESCENCE
ABA (AUTHOR)
ABS A CORRELATION BETWEEN THE MORPHOLOGY, CHEMISTRY, AND OPTICAL PROPERTIES OF SPACE SHUTTLE CANDIDATE REUSABLE SURFACE INSULATION COATINGS WERE MADE TO DETERMINE THE PROPER TEST ENVIRONMENT FOR FLIGHT EVALUATION STUDIES. THE OPTICAL PROPERTIES (SOLAR ABSORPTION COEFFICIENT AND TOTAL HEMISPHERICAL EMITTANCE) FOR EACH COATING WERE OBTAINED AS A FUNCTION OF EXPOSURE TO RADIANT AND CONVECTIVELY HEATED ENVIRONMENTS SINCE THESE PARAMETERS DEFINE THE SURFACE TEMPERATURE OF THE MATERIAL DURING FLIGHT. RESULTS ARE PRESENTED WHICH SHOW THESE OPTICAL PROPERTIES DIFFER IN THE TWO ENVIRONMENTS AND CAN BE RELATED TO THE COATING'S SURFACE AND BULK CHEMISTRY.

76A12807*# ISSUE 3 PAGE 294 CATEGORY 16 AAS PAPER 75-180
NAS8-31312 75/08/00 22 PAGES UNCLASSIFIED DOCUMENT
LST REFURBISHMENT AND SUPPORT
A/HENSCHKE, J. A/(MARTIN MARIETTA AEROSPACE, DENVER, COLO.)
MARTIN MARIETTA AEROSPACE, DENVER, COLO.
AAS, AIAA, IEEE, ORSA, AND IMS, MEETING ON SPACE SHUTTLE MISSIONS OF THE 80'S, DENVER, COLO., AUG. 26-28, 1975, AAS 22 P.
/*GROUND SUPPORT SYSTEMS/*LARGE SPACE TELESCOPE/*MISSION PLANNING/*SPACE MAINTENANCE/ COST ANALYSIS/ ELECTRIC EQUIPMENT TESTS/ FAILURE ANALYSIS/ GROUND TESTS/ IN-FLIGHT MONITORING/ MATERIALS HANDLING/ OPTICAL CORRECTION PROCEDURE/ RELIABILITY ENGINEERING/ SPACE SHUTTLES/ SPACE VEHICLE CHECKOUT PROGRAM/ THERMAL CONTROL COATINGS/ TOOLS
ABA (AUTHOR)
ABS THE LARGE SPACE TELESCOPE (LST) IS A SPACE SHUTTLE PAYLOAD WITH RELATIVELY HIGH RELIABILITY, BUT IT WILL REQUIRE MAINTENANCE SUPPORT IN ORDER TO MEET THE OPERATIONAL LIFE REQUIREMENT OF 15 YEARS. IT WAS DETERMINED THAT IT WOULD BE EFFICIENT AND ECONOMICAL TO SUPPORT LST BY HAVING FOUR LIMITED INFLIGHT MAINTENANCE (IFM) MISSIONS AND THREE GROUND REFURBISHMENTS. THE IFM MISSIONS WOULD INCLUDE REPLACEMENT OF THE FOUR ITEMS WITH A LIMITED OPERATING LIFE. THE LST PROGRAM WOULD PROVIDE FOR A GROUND REFURBISHMENT EVERY FOUR YEARS AT A CENTRAL PAYLOAD DEPOT. IT WAS RECOMMENDED THAT THE DEPOT SHOULD BE LOCATED AT MSFC AND BE MANNED BY A PERMANENT PARTY WHICH WOULD BE AUGMENTED ON A TEMPORARY BASIS DURING LST REFURBISHMENTS BY ENGINEERING PERSONNEL FROM THE LST CONTRACTORS. REQUIRED SPARE PARTS WOULD BE ACQUIRED INCREMENTALLY FOR THE DEPOT BASED ON MAXIMUM REFURBISHMENT OF REPAIRABLE ITEMS.

75A40851# ISSUE 20 PAGE 2935 CATEGORY 18 ASME PAPER 75-ENAS-62
75/07/00 10 PAGES UNCLASSIFIED DOCUMENT
SPACELAB ACTIVE AND PASSIVE THERMAL CONTROL SYSTEMS
A/HASSAN, H.; B/BECKER, J.; C/DEGLIO-ESPOSTI, P. L. B/(ESRO, EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTRE, NOORDWIJK, NETHERLANDS)
MEMBERS, $1.00; NONMEMBERS, $3.00
ASME, SAE, AIAA, ASMA, AND AICHE, INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CALIF., JULY 21-24, 1975, ASME 10 P.
/*HEAT EXCHANGERS/*MULTILAYER INSULATICN/*SPACECRAFT

ENVIRONMENTS/*SPACELAB/*TEMPERATURE CONTROL/ DESIGN ANALYSIS/ FREON/ HEAT SINKS/ OPTIMIZATION/ SPACE SHUTTLE ORBITERS/ SYSTEMS ENGINEERING/ TECHNOLOGICAL FORECASTING/ THERMAL CONTROL COATINGS/ WATER

ABA (AUTHOR)

ABS THE SPACELAB THERMAL CONTROL SYSTEM (TCS) REJECTS ALL THE HEAT PRODUCED IN SPACELAB BY EXPERIMENT AND SUBSYSTEM EQUIPMENT, CHEMICAL AND METABOLIC PROCESSES. THE ACTIVE THERMAL CONTROL SECTION (ATCS) CONSISTS OF WATER AND FREON COOLING LOOPS. WATER LOOP IS USED IN THE HABITABLE AREAS TO COLLECT THE HEAT FROM TWO AIR LOOPS AND INTERFACES WITH THE SHUTTLE ORBITER PAYLOAD HEAT EXCHANGER WHICH IS USED AS A HEAT SINK FOR THE SPACELAB HEAT REJECTION. THE PALLET THERMAL LOAD IS TRANSFERRED TO THE WATER LOOP THROUGH AN INTERLOOP HEAT EXCHANGER. THE SPACELAB PASSIVE THERMAL CONTROL SECTION (PTCS) EMPLOYS MULTILAYER INSULATION ON THE MODULE AND PALLET STRUCTURES. THE TCS DESIGN AND ANALYSIS ACTIVITIES STARTED IN MID 1974. DEVELOPMENT TESTS ON COMPONENT LEVEL ARE IN PROGRESS AND WILL BE COMPLETED BY MID 1976. QUALIFICATION TESTING IS SCHEDULED TO BE COMPLETED BY MID 1977. THE FLIGHT UNIT MANUFACTURING IS PLANNED TO BE COMPLETED IN THE FIRST QUARTER OF 1978.

75A32883# ISSUE 15 PAGE 2133 CATEGORY 12 AIAA PAPER 75-689
75/05/00 11 PAGES UNCLASSIFIED DOCUMENT

RESULTS OF THE POLYMERIC FILMS SKYLAB D024 EXPERIMENT

A/HURLEY, C. J.; B/LEHN, W. L. A/(DAYTON, UNIVERSITY, DAYTON, OHIO); B/(USAF, MATERIALS LABORATORY, WRIGHT-PATTERSON AFB, OHIO)

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, THERMOPHYSICS CONFERENCE, 10TH, DENVER, COLO., MAY 27-29, 1975, 11 P. USAF-SUPPORTED RESEARCH.

/*AEROSPACE ENVIRONMENTS/*EXTRAVEHICULAR ACTIVITY/*POLYMERIC FILMS/*RADIATION EFFECTS/*SKYLAB PROGRAM/ MATERIALS TESTS/ PHYSICAL PROPERTIES/ PLASTIC COATINGS/ THERMAL CONTROL COATINGS

ABA (AUTHOR)

ABS RESULTS OF AN EXPERIMENT DESIGNED TO EVALUATE THE EFFECTS OF THE NEAR EARTH ENVIRONMENT ON THE PERFORMANCES AND PROPERTIES OF SELECTED POLYMERIC FILMS WERE EXPOSED TO THE SKYLAB SPACE ENVIRONMENT FOR VARYING PERIODS OF TIME DURING THE MISSION. THE INDIVIDUAL SPECIMEN HOLDERS WERE RETRIEVED DURING EVA BY THE ASTRONAUTS, PLACED IN HERMETICALLY SEALED CONTAINERS, RECOVERED AND RETURNED TO THE AIR FORCE MATERIALS LABORATORY FOR ANALYSIS AND EVALUATION. POST FLIGHT ANALYSIS OF THE THREE SETS OF RECOVERED POLYMERIC FILMS INDICATED MEASURED CHANGES IN THE OPTICAL, PHYSICAL AND ELECTRICAL PROPERTIES WERE DUE TO A COMBINATION OF EXCESSIVE CONTAMINATION, SOLAR DEGRADATION OF THE CONTAMINANT LAYER AND DEGRADATION OF THE POLYMER FILM MATERIALS. THE DEGREE OF CONTAMINATION EXPERIENCED COMPROMISES THE MEASUREMENT OF THE DEGRADATION OF THE POLYMERIC FILM THEMSELVES. EXPERIMENTAL RESULTS ON THE ANALYSIS OF CONTAMINATION ARE ALSO PRESENTED.

75A32859*# ISSUE 15 PAGE 2147 CATEGORY 27 AIAA PAPER 75-737
NAS1-12962 75/05/00 7 PAGES

UNCLASSIFIED DOCUMENT

ABLATIVE OVERLAYS FOR SPACE SHUTTLE LEADING EDGE ASCENT HEAT PROTECTION

A/STRAUSS, E. L.   A/(MARTIN MARIETTA AEROSPACE, DENVER, COLO.)
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, THERMOPHYSICS CONFERENCE, 10TH, DENVER, COLO., MAY 27-29, 1975, 7 P.
/*ABLATIVE MATERIALS/*ASCENT TRAJECTORIES/*HEAT SHIELDING/*SPACE SHUTTLE ORBITERS/*SPACECRAFT SHIELDING/ FLIGHT SIMULATION/ LEADING EDGES/ PLASTIC COATINGS/ PULSE HEATING/ THERMAL CONTROL COATINGS/ THERMAL PROTECTION/ THERMOGRAVIMETRY
ABA (AUTHOR)
ABS ABLATIVE OVERLAYS WERE EVALUATED VIA A PLASMA-ARC SIMULATION OF THE ASCENT PULSE ON THE LEADING EDGE OF THE SPACE SHUTTLE ORBITER. OVERLAY CONCEPTS INCLUDED CORKBOARD, POLYISOCYANURATE FOAM, LOW-DENSITY TEFLON, EPOXY, AND SUBLIMING SALTS. THEIR DENSITIES RANGED FROM 4.9 TO 81 LB PER CU FT, AND THE THICKNESSES VARIED FROM 0.107 TO 0.330 IN. SWEPT-LEADING-EDGE MODELS WERE FABRICATED FROM 30-LB PER CU FT SILICONE-BASED ABLATORS. THE OVERLAYS WERE BONDED TO MAINTAIN THE SURFACE TEMPERATURE OF THE BASE ABLATOR BELOW 500 F DURING ASCENT. FOAMS PROVIDED MINIMUM-WEIGHT OVERLAYS, AND SUBLIMING SALTS PROVIDED MINIMUM-THICKNESS OVERLAYS. TEFLON LEFT THE MOST UNIFORM SURFACE AFTER ASCENT HEATING.

75A24184#   ISSUE 9   PAGE 1252   CATEGORY 27   74/00/00 13 PAGES   IN FRENCH   UNCLASSIFIED DOCUMENT
EMITTANCE OF CERTAIN HYGROSCOPIC COATINGS FOR THERMAL CONTROL
A/MINIER, C. F.; B/LEVADOU, F.   B/(ESRO, EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTRE, NOORDWIJK, NETHERLANDS)
IN EVALUATION OF THE EFFECT OF THE SPACE ENVIRONMENT ON MATERIALS; INTERNATIONAL CONFERENCE, TOULOUSE, FRANCE, JUNE 17-21, 1974, PROCEEDINGS. (A75-24160 09-18) PARIS, CENTRE NATIONAL D'ETUDES SPATIALES, 1974, P. 425-436; COMMENTS, P. 437. IN FRENCH.
/*EMITTANCE/*ENVIRONMENT EFFECTS/*HYGROSCOPICITY/*POLYMERIC FILMS/*THERMAL CONTROL COATINGS/*VACUUM EFFECTS/ AEROSPACE ENVIRONMENTS/ HUMIDITY MEASUREMENT/ POLYESTER RESINS/ POLYIMIDE RESINS/ PORTABLE EQUIPMENT
ABA (AUTHOR)
ABS SOME MATERIALS, SUCH AS POLYIMIDE FILMS, USED AS THERMAL CONTROL COATINGS ARE SLIGHTLY HYGROSCOPIC. MEASUREMENTS OF THE TOTAL HEMISPHERICAL EMITTANCE AND OF THE NORMAL EMITTANCE AND THEIR VARIATION RELATIVE TO EITHER THE AMBIENT HUMIDITY OR FROM THE WATER DESORPTION IN VACUUM ARE PRESENTED. THE NECESSARY PRECAUTIONS REQUIRED WHEN SUCH MEASUREMENTS ARE TAKEN, ESPECIALLY WHERE PORTABLE EQUIPMENT IS USED, ARE ALSO GIVEN.

75A24160   ISSUE 9   PAGE 1232   CATEGORY 18   74/00/00 891 PAGES   UNCLASSIFIED DOCUMENT
EVALUATION OF THE EFFECT OF THE SPACE ENVIRONMENT ON MATERIALS; INTERNATIONAL CONFERENCE, TOULOUSE, FRANCE, JUNE 17-21, 1974, PROCEEDINGS
CONFERENCE SPONSORED BY THE CENTRE NATIONAL D'ETUDES SPATIALES. PARIS, CENTRE NATIONAL D'ETUDES SPATIALES, 1974. 891 P. IN FRENCH AND ENGLISH.
/*AEROSPACE ENVIRONMENTS/*CONFERENCES/*ENVIRONMENT EFFECTS/*SEMICONDUCTORS (MATERIALS)/*SPACE ENVIRONMENT

SIMULATION/*SPACECRAFT CONSTRUCTION MATERIALS/ COSMIC DUST/ JUPITER ATMOSPHERE/ MICROMETEORITES/ QUARTZ CRYSTALS/ RADIATION SHIELDING/ SATELLITE-BORNE INSTRUMENTS/ SOLAR CELLS/ THERMAL CONTROL COATINGS
ABA P.T.H.
ABS PAPERS ARE PRESENTED DEALING WITH MEASURING TECHNIQUES FOR THE INVESTIGATION OF THE EFFECTS OF SPACE CONTAMINATION IN SEMICONDUCTING AND NONSEMICONDUCTING MATERIALS. QUESTIONS OF STANDARDIZATION ARE CONSIDERED, AND SIMULATION TECHNIQUES ARE DESCRIBED. SOME OF THE TOPICS COVERED INCLUDE RADIATION SHIELDING FOR QUARTZ CRYSTALS IN SATELLITES, CALCULATION OF ENVIRONMENTAL FLUXES AND DOSES ABSORBED ON THE GEOS SATELLITE, JUPITER'S RADIATION BELTS AND THEIR EFFECTS ON SPACECRAFT, SIMULATION OF THE COSMIC DUST AND MICROMETEORITE PARTICLE STREAMS, REDUCTION OF SILICONE OUTGASSING BY PURIFICATION, EMITTANCE OF CERTAIN HYGROSCOPIC THERMAL CONTROL COATINGS, SIMULATION OF THE COSMIC CORPUSCULAR RADIATION EFFECTS ON OPTICAL MATERIALS, AND RADIATION EFFECTS ON HIGH-EFFICIENCY SILICON SOLAR CELLS. INDIVIDUAL ITEMS ARE ANNOUNCED IN THIS ISSUE.

74A39139# ISSUE 19 PAGE 2664 CATEGORY 5 ASME PAPER 74-ENAS-43
74/07/00 11 PAGES UNCLASSIFIED DOCUMENT
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING
A/FLEMING, M. L.; B/HOWELL, H. R.; C/DIETZ, J. B.; D/REED, M. W.
D/(LTV AEROSPACE CORP., VOUGHT SYSTEMS DIV., DALLAS, TEX.) MEMBERS, $1.00; NONMEMBERS, $3.00
SAE, AIAA, ASME, ASMA, AND AICHE, INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SEATTLE, WASH., JULY 29-AUG. 1, 1974, ASME 11 P.
/*PERFORMANCE TESTS/*SPACE ENVIRONMENT SIMULATION/*SPACE SHUTTLE ORBITERS/*SPACECRAFT RADIATORS/*TEMPERATURE CONTROL/ COOLING SYSTEMS/ HEAT SINKS/ SATELLITE TEMPERATURE/ THERMAL CONTROL COATINGS/ THERMAL CYCLING TESTS/ THERMAL VACUUM TESTS
ABA (AUTHOR)
ABS A SERIES OF SYSTEM DEVELOPMENT TESTS WERE CONDUCTED ON POTENTIAL SHUTTLE ACTIVE THERMAL CONTROL SYSTEMS. INCLUDED IN THIS TESTING WERE TESTS OF SYSTEMS COMPOSED OF SEVERAL FLOW ARRANGEMENTS OF EIGHT RADIATOR PANELS OF A MODULAR DESIGN. ALSO INCLUDED WERE TESTS OF SYSTEMS COMPOSED OF THE EIGHT RADIATOR PANELS OPERATING IN COMBINATION WITH AN EVAPORATIVE HEAT SINK. IN ADDITION, COATINGS EVALUATION TESTINGS OF A VAPOR-DEPOSITED-SILVER ON TEFLON COATING WAS CONDUCTED TO DETERMINE THE ADHESION CAPABILITIES OF EIGHT CANDIDATE ADHESIVES UNDER SPACE SIMULATED CONDITIONS AND OPERATIONAL THERMAL CYCLES. THE TEST ARTICLES AND SYSTEMS FOR THESE THREE TESTS ARE DESCRIBED AND THE TEST PLANNING AND OBJECTIVES DISCUSSED. A SUMMARY OF THE SIGNIFICANT RESULTS OF THE TESTING IS PRESENTED.

74A22673# ISSUE 9 PAGE 1253 CATEGORY 18 73/09/00 34 PAGES
UNCLASSIFIED DOCUMENT
GENERAL ASPECTS OF SPACE SIMULATION VALIDITY AND COMPARISON BETWEEN LABORATORY AND IN-FLIGHT DEGRADATION --- OF THERMAL CONTROL COATINGS
A/TRIOLO, J. J.
ONERA AND INSTITUT DE RECHERCHE D'INFORMATIQUE ET D'AUTOMATIQUE, INTERNATIONAL SEMINAR ON SIMULATION AND SPACE, ECOLE NATIONALE SUPERIEURE DE L'AERONAUTIQUE ET DE L'ESPACE, TOULOUSE, FRANCE, SEPT.

10-14, 1973, PAPER. 34 P.
/*FLIGHT TESTS/*GROUND TESTS/*SPACE ENVIRONMENT SIMULATION/*SPACECRAFT CONTROL/*THERMAL CONTROL COATINGS/ CALORIMETERS/ DEGRADATION/ EPOXY RESINS/ MICROWAVE RESONANCE/ SPACE LABORATORIES/ SPACECRAFT STABILITY/ THERMAL RESISTANCE
ABA (AUTHOR)
ABS A DISCUSSION OF VARIOUS TYPES OF THERMAL CONTROL COATINGS TESTS IS PRESENTED INDICATING THEIR ADVANTAGES AND DISADVANTAGES. SEVERAL FLIGHT EXPERIMENTS, BOTH COLORIMETRIC AND RADIOMETRIC, ARE DESCRIBED IN SOME DETAIL. DETERMINATIONS OF SPECTRAL AND ENERGY DEPENDENCE OF DAMAGE FOR THE TEST MATERIALS ARE IMPERATIVE IN THE DESIGN OF VALID LABORATORY TESTS IN WELL CHARACTERIZED LABORATORY FACILITIES. TWO LABORATORY TESTS WHICH WERE USED IN THE QUALIFICATION AND SELECTION OF ALZAK ARE DESCRIBED. RESULTS FROM THE THERMAL CONTROL COATINGS EXPERIMENTS ON ATS-1, OSO-H, AND IMP-H ARE PRESENTED. IN GENERAL, LABORATORY DATA QUALITATIVELY AGREES WITH FLIGHT DATA ALTHOUGH SEVERAL INCONSISTENCIES EXIST.

73A36351*# ISSUE 18 PAGE 2336 CATEGORY 23 AIAA PAPER 73-734
73/07/00 6 PAGES UNCLASSIFIED DOCUMENT
OPTICAL STABILITY OF COATINGS EXPOSED TO FOUR YEARS SPACE ENVIRONMENT ON OSO-III.
A/MILLARD, J. P.; B/PEARSON, B. D., JR. B/(NASA, AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.) MEMBERS, $1.50; NONMEMBERS, $2.00
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, THERMOPHYSICS CONFERENCE, 8TH, PALM SPRINGS, CALIF., JULY 16-18, 1973, 6 P.
/*AEROSPACE ENVIRONMENTS/*ENVIRONMENT EFFECTS/*OPTICAL PROPERTIES/*SOLAR ENERGY ABSORBERS/*THERMAL CONTROL COATINGS/ ABSORPTANCE/ BARRIER LAYERS/ CALORIMETERS/ EMITTANCE/ INFRARED RADIATION/ MATERIALS TESTS/ OSO-3/ RADIATION ABSORPTION
ABA T.M.
ABS THE THERMAL CONTROL COATINGS EXPERIMENT FLOWN ON OSO 3 IN THE NEAR-EARTH SPACE ENVIRONMENT WAS DESIGNED TO MEASURE CHANGES IN THE SOLAR ABSORPTANCE AND IR EMITTANCE OF SELECTED TEST COATINGS. THE PRESENT WORK DESCRIBES RESULTS OBTAINED FROM FOUR YEARS IN ORBIT. CHANGES IN SOLAR ABSORPTANCE OF THE COATINGS ARE ILLUSTRATED AS A FUNCTION OF EQUIVALENT SUN HOURS, AND IT IS SEEN THAT FIVE OF ELEVEN COATINGS CONSIDERED EXHIBIT NO CHANGE IN SOLAR ABSORPTANCE OVER FOUR YEARS OR 7500 EQUIVALENT SUN HOURS. THE EFFECTS OF MICROMETEOROIDS ON POLISHED METAL SURFACES ARE JUDGED TO BE NEGLIGIBLE FOR A NEAR-EARTH MISSION OF FOUR YEARS.

73A36350*# ISSUE 18 PAGE 2336 CATEGORY 23 AIAA PAPER 73-733
NGR-19-001-068 73/07/00 6 PAGES UNCLASSIFIED DOCUMENT
RADIATIVE PROPERTY DEGRADATION OF WATER IMPINGING ON THERMALLY-CONTROLLED SURFACES UNDER SPACE CONDITIONS.
A/MAPLES, D.; B/SPILLER, M. H.; C/MAPLES, G. A/(LOUISIANA STATE UNIVERSITY, BATON ROUGE, LA.); B/(BEACH AIRCRAFT, BOULDER, COLO.); C/(AUBURN UNIVERSITY, AUBURN, ALA.) MEMBERS, $1.50; NONMEMBERS, $2.00
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, THERMOPHYSICS CONFERENCE, 8TH, PALM SPRINGS, CALIF., JULY 16-18, 1973, 6 P.
/*METAL FOILS/*PAINTS/*REFLECTANCE/*SPACE ENVIRONMENT

SIMULATION/*THERMAL CONTROL COATINGS/*WATER EROSION/ AEROSPACE ENVIRONMENTS/ ALUMINUM/ JET IMPINGEMENT/ MONOCHROMATIC RADIATION/ OPTICAL PROPERTIES/ WASTE DISPOSAL

ABA M.V.E.

ABS REVIEW OF THE RESULTS OF AN INVESTIGATION AIMED AT DETERMINING EXPERIMENTALLY THE DIRECTIONAL MONOCHROMATIC REFLECTANCE CHANGES CAUSED UNDER HIGH-VACUUM SPACE CONDITIONS BY A WATER SPRAY IMPINGING ON THERMALLY CONTROLLED SURFACES CONSISTING OF THREE PAINT SPECIMENS (Z93, S13G, AND 92-007) AND AN ALUMINUM FOIL. THE FIRST TWO PAINTS AND THE ALUMINUM FOIL SUFFERED CONSIDERABLE PHYSICAL DAMAGE, BUT ONLY SMALL CHANGES RESULTED IN THE REFLECTANCE OF THE PAINTS WHILE THE REFLECTANCE OF THE ALUMINUM FOIL DECREASED WITH INCREASE IN EXPOSURE TIME TO THE WATER JET. ONLY THE 92-007 DOW CORNING PAINT RETAINED THE SAME PHYSICAL AND REFLECTIVE CHARACTERISTICS.

73A33059 ISSUE 16 PAGE 2071 CATEGORY 31 73/00/00 14 PAGES
UNCLASSIFIED DOCUMENT

COATING DEVELOPMENT OF MARTIN MARIETTA'S REUSABLE SURFACE INSULATION /MAR-SI/ FOR SPACE SHUTTLE APPLICATIONS.

A/CREEDON, J. F. A/(MARTIN MARIETTA AEROSPACE, DENVER, COLO.)

IN NEW HORIZONS IN MATERIALS AND PROCESSING; PROCEEDINGS OF THE EIGHTEENTH NATIONAL SYMPOSIUM AND EXHIBITION, LOS ANGELES, CALIF., APRIL 3-5, 1973. (A73-33026 16-18) AZUSA, CALIF., SOCIETY FOR THE ADVANCEMENT OF MATERIAL AND PROCESS ENGINEERING, 1973, P. 457-470.

/*CERAMICS/*PROTECTIVE COATINGS/*SHOCK RESISTANCE/*SPACE SHUTTLE ORBITERS/*THERMAL INSULATION/*THERMAL RESISTANCE/ BINDERS (MATERIALS)/ QUARTZ/ REUSABLE SPACECRAFT/ SPACECRAFT DESIGN/ THERMAL CONTROL COATINGS/ THERMAL PROTECTION

ABA V.P.

ABS A STUDY AIMED AT DEVELOPING A COATING TO PROTECT THE REUSABLE SURFACE INSULATION OF THE SPACE SHUTTLE IS DESCRIBED. THE STUDY SHOWED THAT A CERAMIC COATING SYSTEM APPLIED IN ONE COAT IS SUITABLE TO MEET THE REQUIREMENTS OF THE SPACE SHUTTLE ORBITER. QUARTZ LAMP TESTING IS FOUND TO BE A GOOD COATING SCREENING DEVICE, WHILE THE USE OF EUCRYPTITE-BASED GLAZE COMPOSITIONS AS BINDERS FOR GROUND BODY PROVIDES THERMAL SHOCK RESISTANCE AND ECONOMY IN APPLICATION. THE MAIN ADVANTAGE OF THE SINGLE COAT SYSTEM OVER THE MULTIPLE COAT SYSTEM IS THAT IT IS LESS SENSITIVE TO CRACKING ON DRYING PRIOR TO FIRING.

73A18909 ISSUE 7 PAGE 841 CATEGORY 18 71/00/00 6 PAGES
UNCLASSIFIED DOCUMENT

PAINT-TYPE COATINGS FOR SATELLITES.

(WHITE AND BLACK PAINTS FOR SATELLITE THERMAL CONTROL COATINGS, DISCUSSING SPACE ENVIRONMENT RADIATION EFFECTS ON EMISSIVITY AND SOLAR ABSORPTANCE)

A/SUBERCAZE, H. A/(SOCIETE PYROLAC, VITRY-SUR-SEINE, VAL-DE-MARNE, FRANCE)

IN FRENCH SPACE TECHNOLOGY. VOLUME 1. (A73-18901 07-31) PARIS, INFORMATION PROPAGANDE FRANCAISES, EDITEUR; CENTRE NATIONAL D'ETUDES SPATIALES, 1971, P. 95-100. IN ENGLISH AND FRENCH.

/*ABSORPTIVITY/*EMISSIVITY/*PAINTS/*RADIATION EFFECTS/*THERMAL CONTROL COATINGS/ AEROSPACE ENVIRONMENTS/ ALUMINUM COATINGS/ BINDERS

(MATERIALS)/ ENVIRONMENT EFFECTS/ EPOXY RESINS/ PIGMENTS/ RADIATION PROTECTION/ SATELLITE DESIGN/ THERMAL PROTECTION

ABA V.P.

ABS RESEARCH WORK AIMED AT DEVELOPING PAINTS, BINDERS, AND PIGMENTS RESISTANT TO UV RADIATION IS DISCUSSED. THE EMISSIVITY AND SOLAR ABSORPTANCE OF WHITE AND BLACK PAINTS, AND THE INFLUENCE OF RADIATION ON THESE FACTORS IS STUDIED. THE PIGMENTS SELECTED FOR WHITE PAINTS WERE THE OXIDES OF ZINC AND TITANIUM. STUDIES AIMED AT SELECTING CARBON BLACKS WITH MAXIMUM EMISSIVITY AND SOLAR-ABSORPTANCE VALUES LED TO THE CHOICE OF BLACK PAINT WITH AN EPOXY BINDER. THE SELECTION OF ALUMINUM PASTES FOR THE PREPARATION OF ALUMINUM PAINTS WITH OPTIMUM THERMOOPTICAL CHARACTERISTICS IS DESCRIBED, AND THE PREPARATION METHODS DEVELOPED FOR EACH TYPE OF PAINT ARE OUTLINED.

72A26245 ISSUE 11 PAGE 1660 CATEGORY 17 72/04/00 6 PAGES
UNCLASSIFIED DOCUMENT

HEAT SHIELD MATERIALS KEY TO SPACE SHUTTLE.

(SPACE SHUTTLE ORBITER REENTRY HEAT SHIELD MATERIALS, CONSIDERING HOT STRUCTURES AND HOT RADIATIVE METALLIC, CERAMIC INSULATIVE AND ABLATIVE HEAT SHIELDS)

A/KORB, L. J. A/(NORTH AMERICAN ROCKWELL CORP., SPACE DIV., DOWNEY, CALIF.)

METAL PROGRESS, VOL. 101, APR. 1972, P. 83, 84, 86 (3 FF.).

/*ABLATIVE MATERIALS/*CERAMIC COATINGS/*RADIATIVE HEAT TRANSFER/*REENTRY SHIELDING/*SPACE SHUTTLES/*THERMAL INSULATION/ AERODYNAMIC LOADS/ CRYOGENIC FLUIDS/ HOT SURFACES/ METAL MATRIX COMPOSITES/ REINFORCED PLASTICS/ THERMAL CONTROL COATINGS/ THERMAL STRESSES

ABA M.V.E.

ABS REVIEW OF THE VARIOUS APPROACHES PRESENTLY UNDER STUDY TO THE HEAT SHIELD PROBLEM OF THE SPACE SHUTTLE ORBITER. THIS HEAT SHIELD IS TO BE CAPABLE OF 100 REENTRY CYCLES, AND THE APPROACHES CONSIDERED INCLUDE HOT STRUCTURES, HOT RADIATIVE METALLIC HEAT SHIELDS, CERAMIC INSULATIVE HEAT SHIELDS, AND ABLATIVE HEAT SHIELDS.

77N79027* NASA-CR-128503 NAS9-10853 72/06/15 104 PAGES
UNCLASSIFIED DOCUMENT

EVALUATION OF NONMETALLIC THERMAL PROTECTION MATERIALS FOR THE MANNED SPACE SHUTTLE. VOLUME 6 (PHASE 2, TASK 2) RESULTS OF EVALUATION TO PROVIDE EXTENSIVE SCREENING DATA ON INHIBITED CARBON/CARBON COMPOSITE MATERIAL FINAL REPORT

A/KIRKHART, F. P.; B/DUCKWORTH, W. H.; C/GRINBERG, I. M. ; D/DROEGE, J. W.; E/FOSTER, E. L.

BATTELLE COLUMBUS LABS., OHIO. AVAIL.NTIS

/*CARBON COMPOUNDS/*SPACE SHUTTLE ORBITERS/*THERMAL CONTROL COATINGS/*THERMAL INSULATION/ COMPOSITE MATERIALS/ HIGH TEMPERATURE ENVIRONMENTS/ LEADING EDGES/ THERMODYNAMIC PROPERTIES

75N77711*   NASA-CR-143990 IITRI-C6233-4   NAS8-26791 IITRI PROJ. C6233
71/05/15 27 PAGES   UNCLASSIFIED DOCUMENT
DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS FOR USE IN LARGE SPACE VEHICLES   TRIANNUAL REPORT, 1 JAN. - 30 APR. 1971
A/GILLIGAN, J. E.; B/ASHFORD, N. A.; C/HARADA, Y.; D/LEAS, R. M.; E/GIORI, C.
IIT RESEARCH INST., CHICAGO, ILL.   (TECHNOLOGY CENTER.)
AVAIL.NTIS
/*SPACECRAFT/*TEMPERATURE CONTROL/*THERMAL CONTROL COATINGS/ OPTICAL PROPERTIES/ PROTECTIVE COATINGS/ SPECIFICATIONS/ THERMAL STABILITY

75N70147*   NASA-CR-115583 LMS C-D152738-VOL-2 SS-1187-VOL-2
NAS9-12083   72/01/17 411 PAGES   UNCLASSIFIED DOCUMENT
SPACE SHUTTLE THERMAL PROTECTION SYSTEM DEVELOPMENT. VOLUME 2 DESIGN METHODOLOGY   FINAL REPORT
A/BANAS, R. P.; B/KURAL, M. H.; C/DERUNTZ, J. A.; D/BURNS, A. B.; E/CHINN, A. J.; F/LAMBERT, R.; G/RITZ, J. R.; H/VANWEST, B.; I/WONEIS, J. T.
LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.   (SPACE SYSTEMS DIV.)   AVAIL.NTIS
/*SPACE SHUTTLES/*SYSTEMS ENGINEERING/*THERMAL PROTECTION/ ENVIRONMENTAL TESTS/ HEAT SHIELDING/ MECHANICAL PROPERTIES/ STRESS ANALYSIS/ THERMAL CONTROL COATINGS/ THERMAL INSULATION

75N70146*   NASA-CR-115582 LMSC-D152738-VOL-1 SS-1187   NAS9-12083
72/01/17 242 PAGES   UNCLASSIFIED DOCUMENT
SPACE SHUTTLE THERMAL PROTECTION SYSTEM DEVELOPMENT. VOLUME 1 DESIGN METHODOLOGY   FINAL REPORT
LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.   (SPACE SYSTEMS DIV.)   AVAIL.NTIS
/*SPACE SHUTTLES/*SYSTEMS ENGINEERING/*THERMAL PROTECTION/ ENVIRONMENTAL TESTS/ HEAT SHIELDING/ STRESS ANALYSIS/ THERMAL CONTROL COATINGS/ THERMAL INSULATION/ THERMAL STRESSES

73N73063*   NASA-CR-128982 TRW-17618-H076-R0-00-PT-6   NAS9-8166
70/12/31 74 PAGES   UNCLASSIFIED DOCUMENT
RADIATIVE, ABLATIVE, AND ACTIVE COOLING THERMAL PROTECTION STUDIES FOR THE LEADING EDGE OF A FIXED-STRAIGHT WING SPACE SHUTTLE. PART 6 SUMMARY REPORT AND CONCLUSIONS
A/GOMEZ, A. V.
TRW SYSTEMS GROUP, HOUSTON, TEX.   (THERMODYNAMICS DEPT.)
AVAIL.NTIS
/*AERODYNAMIC HEATING/*HEAT TRANSFER/*LEADING EDGES/*SPACE SHUTTLES/ ABLATION/ AEROTHERMODYNAMICS/ REGENERATIVE COOLING/ THERMAL CONTROL COATINGS

72N73842   70/00/00   193 PAGES   UNCLASSIFIED DOCUMENT
OPTIMIZATION OF THERMAL CONTROL COATINGS FOR CYLINDRICAL SPACECRAFT
PH.D. THESIS
A/CASAGRANDE, R. D.
RENSSELAER POLYTECHNIC INST., TROY, N. Y.   AVAIL   UNIV. MICROFILMS
ORDER NO. 71-3908
/*OPTIMIZATION/*SPACECRAFT/*THERMAL CONTROL COATINGS/ HEAT FLUX/
HEAT TRANSFER

77N27349*#   ISSUE 18   PAGE 2382   CATEGORY 34   NASA-TM-58204
77/00/00   39 PAGES   UNCLASSIFIED DOCUMENT
SURFACE HEAT FLUX DETERMINATION   AN ANALYTICAL AND EXPERIMENTAL
STUDY USING A SINGLE EMBEDDED THERMOCOUPLE
A/WILLIAMS, S. D.;   B/CURRY, D. M.   B/(LOCKHEED ELECTRONICS CO.,
INC., HOUSTON, TEX.)
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LYNDON B. JOHNSON
SPACE CENTER, HOUSTON, TEX.   AVAIL.NTIS   HC A03/MF A01
/*HEAT FLUX/*SURFACE TEMPERATURE/*THERMOCOUPLES/ AERODYNAMIC
HEATING/ ATMOSPHERIC HEATING/ SPACE SHUTTLE ORBITERS/ THERMAL
CONDUCTIVITY/ THERMAL CONTROL COATINGS
ABA AUTHOR
ABS A NUMERICAL METHOD BY WHICH DATA FROM A SINGLE EMBEDDED
THERMOCOUPLE CAN BE USED TO PREDICT THE TRANSIENT THERMAL ENVIRONMENT
FOR BOTH HIGH- AND LOW-CONDUCTIVITY MATERIALS IS DESCRIBED. THE RESULTS
OF AN INVESTIGATION PERFORMED TO VERIFY THE METHOD CLEARLY DEMONSTRATE
THAT ACCURATE, TRANSIENT, SURFACE HEATING CONDITIONS CAN BE OBTAINED
FROM A THERMOCOUPLE L.016 CENTIMETERS FROM THE HEATING SURFACE IN A
LOW-CONDUCTIVITY MATERIAL. SPACE SHUTTLE ORBITER THERMAL PROTECTION
SYSTEM MATERIALS HAVING TEMPERATURE- AND PRESSURE-DEPENDENT PROPERTIES,
AND TYPICAL ORBITER ENTRY HEATING CONDITIONS WERE USED TO VERIFY THE
ACCURACY OF THE ANALYTICAL PROCEDURE. ANALYTICALLY GENERATED, AS WELL
AS EXPERIMENTAL, DATA WERE USED TO COMPARE PREDICTED AND MEASURED
SURFACE TEMPERATURES.

77N17901#   ISSUE 8   PAGE 1095   CATEGORY 76   76/00/00   11 PAGES
UNCLASSIFIED DOCUMENT
DAMAGE MECHANISM FOR HEAT-REGULATING COATINGS DUE TO CHARGED AND
MICROMETEORITE PARTICLES
A/PETROV, G. I.   A/ED.
LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.   AVAIL.NTIS
HC A02/MF A01; NATIONAL TRANSLATION CENTER, JOHN CRERAR LIBRARY,
CHICAGO, ILLINOIS 60616
TRANSL. INTO ENGLISH FROM THE BOOK ""MODELIROVANIE TEPLOVYKH
REZHIMOV KOSMICHESKOGO APPARATA I OKRUZHAIUSHCHEI EGO SREDY'' MOSCOW,
MASHINOSTROENIE PRESS, 1971   P 90-101
/*IMPACT DAMAGE/*MICROMETEOROIDS/*RADIATION
DAMAGE/*SPACECRAFT/*THERMAL CONTROL COATINGS/ ATOMIZING/ CRYSTAL
LATTICES/ OPTICAL PROPERTIES/ SURFACE PROPERTIES
ABA I.M.
ABS THE INFLUENCE OF IONIZING RADIATION ON THE SOLAR RADIATION
ABSORPTION COEFFICIENT AND THE COEFFICIENT OF EMISSIVITY OF THE
COATINGS OF A SPACE VEHICLE WAS INVESTIGATED. IT WAS FOUND THAT VARIOUS

PHYSICOCHEMICAL PROCESSES, WHICH ALTER THE OPTICAL AND OTHER CHARACTERISTICS OF THE COATINGS, OCCUR UNDER THE ACTION OF SPACE CORPUSCULAR RADIATION AND METEORITE PARTICLES ON HEAT-REGULATING MATERIALS. THESE PROCESSES RESULT IN A CHANGE OF BOTH OF THE COEFFICIENTS. THE CAUSES FOR THE CHANGE IN THE OPTICAL CHARACTERISTICS OF HEAT-REGULATING COATINGS WAS DETERMINED AS RADIATION DEFECTS IN THE CRYSTAL LATTICES, FORMATION OF COLORING CENTERS, ATOMIZATION OF THE MATERIAL AND CHANGE OF SURFACE PROPERTIES, AND METEORITE EROSION OF THE SURFACE. THE RADIATION DAMAGE MECHANISMS ARE DESCRIBED IN DETAIL.

77N13921*# ISSUE 4 PAGE 543 CATEGORY 85 NASA-TM-X-73960
NSG-1186 75/08/00 92 PAGES UNCLASSIFIED DOCUMENT
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. EXECUTIVE SUMMARY --- IN-SPACE RESEARCH USING THE SPACE TRANSPORTATION SYSTEM
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.; OLD DOMINION UNIV., NORFOLK, VA.
AVAIL.NTIS HC A05/MF A01
PREPARED JOINTLY WITH OLD DOMINION UNIV., NORFOLK, VA. CONDUCTED AT MADISON COLLEGE, HARRISONBURG, VA., 3-16 AUG. 1975
/*AEROSPACE ENVIRONMENTS/*CONFERENCES/*MISSION PLANNING/*RESEARCH PROJECTS/*SPACE TRANSPORTATION/*SPACELAB/ CRYOGENICS/ DATA PROCESSING/ LIFE SUPPORT SYSTEMS/ SPACE MANUFACTURING/ SPACE SHUTTLES/ THERMAL CONTROL COATINGS/ USER REQUIREMENTS
ABA J.M.S.
ABS RESEARCH AND TECHNOLOGY INVESTIGATIONS ARE IDENTIFIED IN ELEVEN DISCIPLINE TECHNOLOGIES WHICH REQUIRE OR WHICH COULD SIGNIFICANTLY BENEFIT FROM AN IN-SPACE EXPERIMENT, SYSTEMS DEMONSTRATIONS, OR COMPONENT TEST USING THE SPACE TRANSPORTATION SYSTEM. SYNOPSES OF THE ELEVEN TECHNOLOGY PANELS REPORTS ARE PRESENTED.

77N13917*# ISSUE 4 PAGE 542 CATEGORY 85 NASA-TM-X-73968
NSG-1186 75/08/00 170 PAGES UNCLASSIFIED DOCUMENT
NASA OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY SUMMER WORKSHOP. VOLUME 8 THERMAL CONTROL PANEL FINAL REPORT
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.; OLD DOMINION UNIV., NORFOLK, VA.
AVAIL.NTIS HC A08/MF A01
PREPARED JOINTLY WITH OLD DOMINION UNIV., NORFOLK, VA. CONDUCTED AT MADISON COLLEGE, HARRISONBURG, VA., 3-16 AUG. 1975
/*CONFERENCES/*MISSION PLANNING/*SPACELAB/*TECHNOLOGY ASSESSMENT/*TEMPERATURE CONTROL/ CRYOGENICS/ LIFE (DURABILITY)/ SPACE SHUTTLES/ TEMPERATURE GRADIENTS/ THERMAL CONTROL COATINGS/ THERMAL STABILITY
ABA J.M.S.
ABS TECHNOLOGY DEFICIENCIES IN THE AREA OF THERMAL CONTROL FOR FUTURE SPACE MISSIONS ARE IDENTIFIED WITH EMPHASIS ON LARGE SPACE STRUCTURES AND COLD CONTROLLED ENVIRONMENTS. THERMAL CONTROL SURFACES, HEAT PIPES, AND CONTAMINATION ARE CONSIDERED ALONG WITH CRYOGENICS, INSULATION, AND DESIGN TECHNIQUES. MAJOR DIRECTIONS FORECAST FOR THERMAL CONTROL TECHNOLOGY DEVELOPMENT AND SPACE EXPERIMENTS ARE (1)

EXTEND THE USEFUL LIFETIME OF CRYOGENIC SYSTEMS FOR SPACE, (2) REDUCE TEMPERATURE GRADIENTS, AND (3) IMPROVE TEMPERATURE STABILITY.

77N13410# ISSUE 4 PAGE 475 CATEGORY 36 CNES-NT-36 76/05/00
23 PAGES IN FRENCH; ENGLISH SUMMARY UNCLASSIFIED DOCUMENT DCAF E002583

LUNAR LASER REFLECTORS. PRELIMINARY STUDY OF LASER REFLECTOR THERMAL CONTROL

A/MAUROY, P.

CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE (FRANCE). AVAIL.NTIS HC A02/MF A01

/*LASER RANGE FINDERS/*LUNAR RETROREFLECTORS/*TEMPERATURE CONTROL/*THERMAL CONTROL COATINGS/ ALUMINUM COATINGS/ GLASS/ LUNAR ENVIRONMENT/ LUNAR RANGEFINDING/ MIRRORS/ TEMPERATURE GRADIENTS

ABA AUTHOR (ESA)

ABS THE POSSIBILITY WAS INVESTIGATED OF USING PASSIVE THERMAL CONTROL TO OBTAIN A MAXIMUM DIURNAL TEMPERATURE OF 100 C AND A MINIMUM NOCTURNAL TEMPERATURE OF -70 C ON A HOLLOW LASER REFLECTOR DEPOSITED ON THE MOON. THE FACETS OF THE REFLECTOR ARE BASICALLY CONSTITUTED BY SPECULAR ALUMINIZED SITAL. TWO SOLUTIONS WERE STUDIED ONE IN WHICH THE INTERNAL FACES ARE COVERED WITH A SECOND SURFACE MIRROR TYPE COATING, AND ANOTHER IN WHICH THE INTERNAL FACES ARE NOT COATED, THE APERTURE OF THE REFLECTOR BEING CLOSED BY A THIN GLASS PLATE. IT WAS CONCLUDED THAT BOTH SOLUTIONS WERE VIABLE, THE FIRST ONE BEING PREFERABLE BECAUSE IT IS TECHNOLOGICALLY FEASIBLE AND SIMPLER THAN THE OTHER FROM A MECHANICAL POINT OF VIEW.

76N31274# ISSUE 22 PAGE 2837 CATEGORY 18 RAE-TR-75123 BR50460
75/12/00 109 PAGES UNCLASSIFIED DOCUMENT DCAF E010257

THE PROSPERO THERMAL CONTROL SURFACES EXPERIMENT --- INVESTIGATION OF THERMAL CONTROL SURFACE MATERIALS IN SPACE ENVIRONMENT

A/KEYTE, G. E.

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND). AVAIL.NTIS HC $5.50

/*RADIATION MEASUREMENT/*SURFACE PROPERTIES/*THERMAL CONTROL COATINGS/*UK SATELLITES/ AEROSPACE ENVIRONMENTS/ EXPERIMENTAL DESIGN/ IN-FLIGHT MONITORING/ SURFACE FINISHING/ THERMAL CYCLING TESTS

ABA AUTHOR (ESA)

ABS THE PROSPERO THERMAL CONTROL SURFACES EXPERIMENT WAS CONCEIVED AS A METHOD OF INVESTIGATING THE BEHAVIOR OF VARIOUS THERMAL CONTROL SURFACE MATERIALS IN A SPACE ENVIRONMENT. THE RESULTS OF LABORATORY TESTS ON SELECTED MATERIALS, THE DESIGN AND CONSTRUCTION OF THE EXPERIMENT AND THE ANALYSIS OF DATA OBTAINED FROM THE FLIGHT OF THE PROSPERO SPACECRAFT ARE DESCRIBED. THE EXPERIMENT WAS NOT SENSITIVE ENOUGH TO MEASURE CHANGES IN SURFACE RADIATION PROPERTIES ACCURATELY, BUT IT WAS POSSIBLE TO IDENTIFY SOME SURFACES AS BEING SATISFACTORY FOR USE AND REJECT OTHERS AS BEING UNSATISFACTORY.

76N30445*#   ISSUE 21   PAGE 2721   CATEGORY 33   NASA-TM-X-73467
E-8836   76/07/00   42 PAGES   UNCLASSIFIED DOCUMENT
ENVIRONMENTAL CHARGING OF SPACECRAFT SURFACES   TESTS OF THERMAL CONTROL MATERIALS FOR USE ON THE GLOBAL POSITIONING SYSTEM FLIGHT SPACE VEHICLE. PART 1   SPECIMENS 1 TO 5
A/STEVENS, N. J.;   B/KLINECT, V. W.;   C/BERKOPEC, F. D.
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.   AVAIL.NTIS   HC $4.00
/*ELECTROSTATIC CHARGE/*SPACECRAFT/*SPACECRAFT ORBITS/*THERMAL CONTROL COATINGS/ AEROSPACE ENVIRONMENTS/ CHARGED PARTICLES/ ELECTRIC DISCHARGES
ABA AUTHOR
ABS THE NASA/USAF PROGRAM ON ENVIRONMENTAL CHARGING OF SPACECRAFT SURFACES CONSISTS OF EXPERIMENTAL EFFORTS DIRECTED TOWARD EVALUATING THE RESPONSE OF MATERIALS TO THE ENVIRONMENTAL CHARGED PARTICLE FLUX. SAMPLES OF THERMAL BLANKETS AND SECOND SURFACE MIRRORS OF THE TYPE TO BE USED ON THE GLOBAL POSITIONING SYSTEM FLIGHT SPACE VEHICLE WERE TESTED TO DETERMINE THEIR RESPONSE TO ELECTRON FLUX. THE PRIMARY RESULT OBSERVED WAS THAT THE GROUND CONNECTION OF THE METAL LAYERS OF THE BLANKET, AS MADE BY THE BASELINE GROUNDING TECHNIQUE USING SERRATED WASHERS AND GROMMETS, DETERIORATED WITH TIME AT TEST. THE DISCHARGES OBSERVED ON THE BLANKETS WERE THE GLOW TYPE, NOT THE 'LIGHTNING' STRIKE OBSERVED ON PAST SPECIMENS. TESTING WAS PERFORMED AT AMBIENT LABORATORY TEMPERATURES.

76N26432*#   ISSUE 17   PAGE 2187   CATEGORY 34   NASA-TN-D-8233
L-10766   76/06/00   35 PAGES   UNCLASSIFIED DOCUMENT
EFFECT OF A SURFACE-TO-GAP TEMPERATURE DISCONTINUITY ON THE HEAT TRANSFER TO REUSABLE SURFACE INSULATION TILE GAPS --- OF THE SPACE SHUTTLE
A/THROCKMORTON, D. A.
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.   AVAIL.NTIS   HC $4.00
WASHINGTON
/*GAPS/*HEAT TRANSFER/*REUSABLE HEAT SHIELDING/*SPACE SHUTTLES/*TEMPERATURE EFFECTS/*TEMPERATURE GRADIENTS/*THERMAL INSULATION/*TILES/ AERODYNAMIC HEATING/ FLAT PLATES/ HEAT MEASUREMENT/ REYNOLDS NUMBER/ THERMAL CONTROL COATINGS/ TURBULENT BOUNDARY LAYER/ WIND TUNNEL MODELS
ABA AUTHOR
ABS AN EXPERIMENTAL INVESTIGATION IS PRESENTED THAT WAS PERFORMED TO DETERMINE THE EFFECT OF A SURFACE-TO-GAP WALL TEMPERATURE DISCONTINUITY ON THE HEAT TRANSFER WITHIN SPACE SHUTTLE, REUSABLE SURFACE INSULATION, TILE GAPS SUBMERGED IN A THICK TURBULENT BOUNDARY LAYER. HEAT-TRANSFER MEASUREMENTS WERE OBTAINED ON A FLAT-PLATE, SINGLE-GAP MODEL SUBMERGED IN A TURBULENT TUNNEL WALL BOUNDARY LAYER AT A NOMINAL FREE-STREAM MACH NUMBER OF 10.3 AND FREE-STREAM REYNOLDS NUMBERS PER METER OF 1.5 MILLION, 3.3 MILLION AND 7.8 MILLION. SURFACE-TO-GAP WALL TEMPERATURE DISCONTINUITIES OF VARYING DEGREE WERE CREATED BY HEATING THE SURFACE OF THE MODEL UPSTREAM OF THE INSTRUMENTED GAP. THE SWEEP ANGLE OF THE GAP WAS VARIED BETWEEN 0 DEG AND 60 DEG; GAP WIDTH AND DEPTH WERE HELD CONSTANT. A SURFACE-TO-GAP WALL TEMPERATURE DISCONTINUITY (SURFACE TEMPERATURE GREATER THAN GAP WALL TEMPERATURE) RESULTS IN INCREASED

HEAT TRANSFER TO THE NEAR-SURFACE PORTION OF THE GAP, AS COMPARED WITH THE HEAT TRANSFER UNDER ISOTHERMAL CONDITIONS, WHILE DECREASING THE HEAT TRANSFER TO THE DEEPER PORTIONS OF THE GAP. THE NONDIMENSIONALIZED HEAT TRANSFER TO THE NEAR-SURFACE PORTION OF THE GAP IS SHOWN TO DECREASE WITH INCREASING REYNOLDS NUMBER; IN THE DEEPER PORTION OF THE GAP, THE HEAT TRANSFER INCREASES WITH REYNOLDS NUMBER.

76N24314*# ISSUE 15 PAGE 1900 CATEGORY 15 NASA-CR-2697
REPT-75-169 NAS2-8490 76/05/00 86 PAGES UNCLASSIFIED DOCUMENT
DEVELOPMENT OF AN IMPROVED COATING FOR POLYBENZIMIDAZOLE FOAM --- FOR SPACE SHUTTLE HEAT SHIELDS
FINAL REPORT
A/NEUNER, G. J.; B/DELANO, C. B. B/(WHITTAKER CORP.)
AEROTHERM ACUREX CORP., MOUNTAIN VIEW, CALIF. AVAIL.NTIS HC $5.00
WASHINGTON NASA
/*HEAT SHIELDING/*POLYBENZIMICAZOLE/*SPACE SHUTTLES/*SPACECRAFT CONSTRUCTION MATERIALS/*THERMAL CONTROL COATINGS/ FABRICATION/ FOAMS/ MECHANICAL PROPERTIES/ OPTICAL PROPERTIES/ OXIDATION RESISTANCE/ THERMOPHYSICAL PROPERTIES/ TILES/ WEIGHT (MASS)
ABA AUTHOR
ABS AN IMPROVED COATING SYSTEM WAS DEVELOPED FOR POLYBENZIMIDAZOLE (PBI) FOAM TO PROVIDE COATING STABILITY, RUGGEDNESS, MOISTURE RESISTANCE, AND TO SATISFY OPTICAL PROPERTY REQUIREMENTS (ALPHA SUB (S/EPSILON) OR = 0.4 AND EPSILON 0.8) FOR THE SPACE SHUTTLE. THE EFFORT WAS PERFORMED IN FIVE TASKS TASK 1 TO ESTABLISH MATERIAL AND PROCESS SPECIFICATIONS FOR THE PBI FOAM, AND MATERIAL SPECIFICATIONS FOR THE COATINGS; TASK 2 TO IDENTIFY AND EVALUATE PROMISING COATINGS; TASK 3 TO ESTABLISH MECHANICAL AND THERMOPHYSICAL PROPERTIES OF THE TILE COMPONENTS; TASK 4 TO DETERMINE BY SYSTEMS ANALYSIS THE POTENTIAL WEIGHT TRADE-OFFS ASSOCIATED WITH A COATED PBI TPS; AND TASK 5 TO ESTABLISH A PRELIMINARY QUALITY ASSURANCE PROGRAM. THE COATED PBI TILE WAS, THROUGH SCREENING TESTS, DETERMINED TO SATISFY THE DESIGN OBJECTIVES WITH A REDUCED SYSTEM WEIGHT OVER THE BASELINE SHUTTLE SILICA LRSI TPS. THE DEVELOPED TILE PROVIDES A THERMALLY STABLE, EXTREMELY RUGGED, LOW THERMAL CONDUCTIVITY INSULATOR WITH A WELL CHARACTERIZED OPTICAL COATING.

76N23584*# ISSUE 14 PAGE 1803 CATEGORY 37 NASA-CR-144310
ITTRI-C6233-57 NAS8-26791 ITTRI PROJ. C6233 76/03/15 466 PAGES UNCLASSIFIED DOCUMENT
DEVELOPMENT OF SPACE-STABLE THERMAL CONTROL COATINGS FOR USE ON LARGE SPACE VEHICLES FINAL REPORT, 4 JAN. 1971 - 1 NOV. 1975
A/GILLIGAN, J. E.; B/HARADA, Y.
IIT RESEARCH INST., CHICAGO, ILL. AVAIL.NTIS
HC $12.00
/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ AEROSPACE ENVIRONMENTS/ CHEMICAL REACTIONS/ ELECTRON PARAMAGNETIC RESONANCE/ ENVIRONMENTAL TESTS/ PIGMENTS/ STOICHIOMETRY/ TITANATES/ ZINC COMPOUNDS
ABA D.M.L.
ABS THE POTENTIAL OF ZINC ORTHOTITANATE AS A PIGMENT FOR SPACECRAFT THERMAL CONTROL WAS DEMONSTRATED. THE PROPERTIES AND PERFORMANCE OF

PIGMENTS PREPARED BY SOLID STATE, COPRECIPITATION, AND MIXED OXALATE METHODS WERE COMPARED. ENVIRONMENTAL TESTS AND SUBSEQUENT SPECTRAL ANALYSIS WERE GIVEN PRIMARY EMPHASIS.

76N22275*# ISSUE 13 PAGE 1627 CATEGORY 18 NASA-CR-147671
MDC-A3155 NAS9-19370 74/12/11 68 PAGES UNCLASSIFIED DOCUMENT
SIMULATED LIGHTNING TEST SHUTTLE .03 SCALE MODEL --- (SPACE SHUTTLE ORBITER) FINAL REPORT
A/CLIFFORD, D. W.
MCDONNELL AIRCRAFT CO., ST. LOUIS, MO. AVAIL.NTIS HC $4.50
/*LIGHTNING/*SCALE MODELS/*SIMULATION/*SPACE SHUTTLE ORBITERS/ ATMOSPHERIC ELECTRICITY/ BOOSTER ROCKET ENGINES/ ELECTRIC SPARKS/ EXHAUST GASES/ EXTERNAL TANKS/ SPACE SHUTTLE BOOSTERS/ THERMAL CONTROL COATINGS/ THERMAL PROTECTION
ABA AUTHOR
ABS LIGHTNING ATTACH POINT TESTS WERE CONDUCTED FOR THE SPACE SHUTTLE LAUNCH CONFIGURATION (ORBITER, EXTERNAL TANK AND SOLID ROCKET BOOSTERS). A SERIES OF 250 LONG SPARK TESTS (15 TO 20 FOOT SPARKS) DETERMINED THAT THE ORBITER MAY BE STRUCK CN THE NOSE, WINDSHIELD BROW, TAIL AND WINGTIPS DURING LAUNCH BUT NOT ON THE MAIN ENGINE NOZZLES WHICH HAVE BEEN SHOWN TO BE VULNERABLE TO LIGHTNING DAMAGE. THE ORBITER MAIN ENGINE AND SRB EXHAUST PLUMES WERE SIMULATED ELECTRICALLY WITH PHYSICAL MODELS COATED WITH GRADED RESISTANCE PAINTS. THE TESTS SHOWED THAT THE EXHAUST PLUMES FROM THE SRB PROVIDE ADDITIONAL PROTECTION FOR THE MAIN ENGINE NOZZLES. HOWEVER, THE TESTS SHOWED THAT THE ORBITER THERMAL PROTECTION SYSTEM (TPS), WHICH HAS ALSO BEEN SHOWN TO BE VULNERABLE TO LIGHTNING DAMAGE, MAY BE STRUCK DURING LAUNCH. THEREFORE FURTHER WORK IS INDICATED IN THE AREAS OF SWEPT STROKE STUDIES ON THE MODEL AND ON TPS PANELS. FURTHER ATTACH POINT TESTING IS ALSO INDICATED CN THE FREE-FLYING ORBITER. PHOTOGRAPHS OF THE TEST SETUP ARE SHOWN.

76N19221# ISSUE 10 PAGE 1227 CATEGORY 18 75/00/00 11 PAGES
UNCLASSIFIED DOCUMENT DCAF E002935
SPACEFLIGHT TECHNOLOGY AT NLR
NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS). AVAIL.NTIS HC $3.50
/*ASTRONOMICAL NETHERLANDS SATELLITE/*EUROPA 2 LAUNCH VEHICLE/*EXOSAT SATELLITE/*HEAT BUDGET/*INERTIAL GUIDANCE/*SATELLITE ATTITUDE CONTROL/ AUTOMATIC PILOTS/ DATA RECORDING/ MISSION PLANNING/ MOMENTUM/ MYLAR (TRADEMARK)/ SPACE LABORATORIES/ THERMAL CONTROL COATINGS/ WHEELS
ABA ESA
ABS THE INERTIAL GUIDANCE SYSTEM TESTING FACILITIES BUILT FOR THE ELDO EUROPA 2 LAUNCH VEHICLE ARE DESCRIBED. STRAPDOWN INERTIAL SYSTEMS AND DOUBLE GIMBALLED MOMENTUM WHEELS FOR ATTITUDE CONTROL OF SPACECRAFT WERE DEVELOPED. MISSION ANALYSIS STUDIES FOR ESRO SATELLITES WERE PERFORMED. THE ASTRONOMICAL NETHERLANDS SATELLITE IS CONTROLLED BY AN NLR OPERATIONS TEAM. STUDIES FOR ESRO HELOS (EXOSAT) SATELLITE EXPERIMENTS AND ESRO SPACELAB USER REQUIREMENTS WERE ALSO PERFORMED.

76N16172* ISSUE 7 PAGE 816 CATEGORY 20 76/01/12 51 PAGES
UNCLASSIFIED DOCUMENT

THE LARGE MOTOR PLUME/MATERIAL IMPINGEMENT TEST PROGRAM AT AEDC UTILIZING THE FOUR SELECTED PROPELLANTS FROM THE SMALL MOTOR TESTS AT MSFC (JULY, AUGUST, AND SEPTEMBER 1974), SECTION 3

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

IN ITS THE EFFECTS OF SOLID ROCKET MOTOR EFFLUENTS ON SELECTED SURFACES AND SOLID PARTICLE SIZE, DISTRIBUTION, AND COMPOSITION FOR SIMULATED SHUTTLE BOOSTER SEPARATICN MOTORS P 152-203 (SEE N76-16169 07-20)

/*ENGINE TESTS/*IMPINGEMENT/*MATERIALS TESTS/*PLUMES/*SPACE SHUTTLE ORBITERS/*SURFACE REACTIONS/ SOLID ROCKET PROPELLANTS/ THERMAL CONTROL COATINGS

ABA AUTHOR

ABS EFFORTS MADE TO DETERMINE THE VULNERABILITY OF ORBITER AND ET MATERIALS LOCATED AT VARIOUS POSITIONS WITHIN EXHAUST PLUMES FROM TEST SSRM'S USING FOUR DIFFERENT PROPELLANT FORMULATIONS ARE DISCUSSED. DATA ALSO COVER THE EFFECT ON TPS MATERIALS FROM A SINGLE SSRM PLUME AND DUAL SSRM PLUMES, AND DEFINITIONS OF TEST SSRM PLUME ENVIRONMENT AT MATERIAL SPECIMEN LOCATIONS.

76N16170* ISSUE 7 PAGE 816 CATEGORY 20 76/01/12 84 PAGES
UNCLASSIFIED DOCUMENT

THE PLUME IMPINGEMENT TEST PROGRAM AT AEDC UTILIZING THE S-2 ULLAGE MOTORS (NOVEMBER 1973), SECTION 1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

IN ITS THE EFFECTS OF SOLID ROCKET MOTOR EFFLUENTS ON SELECTED SURFACES AND SOLID PARTICLE SIZE, DISTRIBUTION, AND COMPOSITION FOR SIMULATED SHUTTLE BOOSTER SEPARATION MOTORS P 12-95 (SEE N76-16169 C7-20)

/*ROCKET EXHAUST/*SPACE SHUTTLES/*SURFACE PROPERTIES/*THERMAL CONTROL COATINGS/*ULLAGE ROCKET ENGINES/ IMPINGEMENT/ PARTICLE SIZE DISTRIBUTION/ PLUMES/ SOLID RUCKET PROPELLANTS

ABA AUTHOR

ABS PROPOSED EXPERIMENTS FOR ANALYZING ROCKET PLUMES ARE REPORTED. TWO GROUPS OF EXPERIMENTS WERE STUDIED (1) THOSE THAT WOULD HELP DEFINE SOME OF THE PARAMETERS THAT CHARACTERIZE THE PLUME AND (2) THOSE THAT WOULD ENABLE EVALUATION OF SOME OF THE CONTAMINATION EFFECTS OF THE PLUME ENVIRONMENT ON VARIOUS ITEMS OF INTEREST. THE ITEMS INVESTIGATED, THE PURPOSE OF THE INVESTIGATION, ARE GIVEN IN TABULAR FORM.

76N16169*# ISSUE 7 PAGE 816 CATEGORY 20 NASA-TM-X-64975
76/01/12 218 PAGES UNCLASSIFIED DOCUMENT

THE EFFECTS OF SOLID ROCKET MOTOR EFFLUENTS ON SELECTED SURFACES AND SOLID PARTICLE SIZE, DISTRIBUTICN, AND COMPOSITION FOR SIMULATED SHUTTLE BOOSTER SEPARATICN MOTORS

A/JEX, D. W.; B/LINTCN, R. C.; C/RUSSELL, W. M.; D/TRENKLE, J. J.; E/WILKES, D. R.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT

CENTER, HUNTSVILLE, ALA.   AVAIL.NTIS   HC $7.75
/*PLUMES/*SOLID ROCKET PROPELLANTS/*SPACE SHUTTLES/*SURFACE REACTIONS/*THERMAL CONTROL COATINGS/ COMPOSITION (PROPERTY)/ MATERIALS TESTS/ PARTICLE SIZE DISTRIBUTICN/ PROTECTIVE COATINGS

ANN A SERIES OF THREE TESTS WAS CONDUCTED USING SOLID ROCKET PROPELLANTS TO DETERMINE THE EFFECTS A SOLID ROCKET PLUME WOULD HAVE ON THERMAL PROTECTIVE SURFACES (TPS). THE SURFACES TESTED WERE THOSE WHICH ARE BASELINED FOR THE SHUTTLE VEHICLE. THE PROPELLANTS USED WERE TO SIMULATE THE SEPARATION SOLID RCCKET MOTORS (SSRM) THAT SEPARATE THE SOLID ROCKET BOOSTERS (SRB) FROM THE SHUTTLE LAUNCH VEHICLE. DATA COVER (1) THE OPTICAL EFFECTS OF THE PLUME ENVIRONMENT ON SPACECRAFT RELATED SURFACES, AND (2) THE SOLID PARTICLE SIZE, DISTRIBUTION, AND COMPOSITION AT TPS SAMPLE LOCATIONS.

76N11140*   ISSUE 2   PAGE 151   CATEGORY 9   PAPER-28   75/00/00   21 PAGES   UNCLASSIFIED DOCUMENT

THE OUTGASSING RATE FOR A SHUTTLE THERMAL PROTECTIVE SURFACE USING RTV 560 ADHESIVE

A/JEX, D. W.;   B/SHRIVER, E. L.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.

IN ITS 8TH CONF. ON SPACE SIMULATION   P 321-341 (SEE N76-11113 02-09)

/*OUTGASSING/*SPACE SHUTTLES/*SURFACE REACTIONS/*THERMAL PROTECTION/ ADHESIVES/ SPACE ENVIRONMENT SIMULATION/ THERMAL CONTROL COATINGS

ABA AUTHOR

ABS AN EXPERIMENTAL PROGRAM WAS CONDUCTED TO IDENTIFY THE OUTGASSING RATE FOR A SHUTTLE BASELINE THERMAL PROTECTIVE SURFACE (TPS) WHICH UTILIZES RCOM TEMPERATURE VOLCANIZING (RTV) 560 ADHESIVE. RESULTS ARE DISCUSSED.

75N18297*#   ISSUE 10   PAGE 1079   CATEGORY 18   NASA-CR-141505 DMS-DR-2225   NAS9-13247   75/02/00   278 PAGES   UNCLASSIFIED DOCUMENT

PHASE CHANGE PAINT TESTS TO INVESTIGATE EFFECTS OF TPS TILES ON HEATING RATES OF THE ROCKWELL SPACE SHUTTLE ORBITER (TEST OH4C, MODEL 21-0)   AERDTHERMODYNAMIC DATA REPORT

A/QUAN, M.   A/(ROCKWELL INTERN. CORP., DOWNEY, CALIF.)

CHRYSLER CORP., NEW ORLEANS, LA.   AVAIL.NTIS   HC $8.75

/*SPACE SHUTTLE ORBITERS/*THERMAL CONTRCL COATINGS/*WIND TUNNEL MODELS/*WIND TUNNEL TESTS/ AERODYNAMIC HEATING/ MATERIALS TESTS/ SPACECRAFT COMPONENTS/ THERMODYNAMIC PROPERTIES

ABA AUTHOR

ABS INFORMATION AND DATA FROM WIND TUNNEL TESTS CONDUCTED ON 0.0175-SCALE MODELS OF THE SPACE SHUTTLE ORBITER ARE PRESENTED. THE PRIMARY OBJECTIVE OF THE TESTS WAS TO EVALUATE AERODYNAMIC HEATING EFFECTS OF THE TILES IN THE THERMAL PROTECTION SYSTEM (TPS). TILE GAP DEPTH AND FLOW ORIENTATION EFFECTS ON THE TPS WERE INVESTIGATED. TILE PATTERNS WERE CUT INTO THE UNDERSIDES OF THE ORBITER MODELS TO SIMULATE THE GAPS. ONE MODEL WAS LEFT SMOOTH FOR COMPARISON.

75N18047*#   ISSUE 9   PAGE 1046   CATEGORY 74   NASA-CR-142074
NGR-43-021-002   75/01/01   5 PAGES
UNCLASSIFIED DOCUMENT
OPTICAL EFFECT OF THE CONTAMINATION OF INFRARED WINDOWS BY THE OUTGASSING OF MATERIALS IN OUTER SPACE   SEMIANNUAL STATUS REPORT, PERIOD ENDING 1 JAN. 1975
A/SILBERMAN, E.
FISK UNIV., NASHVILLE, TENN.   AVAIL.NTIS   HC $3.25
/*AEROSPACE ENVIRONMENTS/*OUTGASSING/*THERMAL CONTROL COATINGS/ ABSORPTION SPECTROSCOPY/ INFRARED SPECTROSCOPY/ SPECTRAL BANDS/ TEMPERATURE EFFECTS
ABA J.M.S.
ABS THE COMPOSITION AND EVAPORATION RATE OF THE OUTGASSING OF A SPACE VEHICLE THERMAL CONTROL PAINT AS A FUNCTION OF TEMPERATURE WERE STUDIED. A CONTAMINATION CHAMBER WAS DESIGNED, CONSTRUCTED, AND TESTED. SAMPLES OF THERMAL CONTROL PAINT WERE TESTED TO DETERMINE IF HEATING TO MODERATE TEMPERATURES CAUSES THEM TO RELEASE OUTGASSING PRODUCTS WHICH CAN BE COLLECTED ON A COOLED CESIUM IODIDE WINDOW FOR IDENTIFICATION BY IR ANALYSIS. RESULTS SHOWED THAT OUTGASSING OF SURFACES OTHER THAN THE SAMPLE WAS A PROBLEM. SPECTRAL BANDS OF THE DEPOSITS COLLECTED WERE COMPARED.

74N35278*#   ISSUE 24   PAGE 3000   CATEGORY 31   NASA-CR-112119-3
NAS1-9793   74/04/00   162 PAGES
UNCLASSIFIED DOCUMENT
EVALUATION OF COATED COLUMBIUM ALLOY HEAT SHIELDS FOR SPACE SHUTTLE THERMAL PROTECTION SYSTEM APPLICATION. VOLUME 3, PHASE 3   FULL SIZE TPS EVALUATION   TECHNICAL REPORT, FEB. 1973 - MAR. 1974
A/BAER, J. W.; B/BLACK, W. E.
GENERAL DYNAMICS/CONVAIR, SAN DIEGO, CALIF.   AVAIL.NTIS   HC $11.25
/*HEAT SHIELDING/*NIOBIUM ALLOYS/*SPACE SHUTTLE ORBITERS/*THERMAL PROTECTION/ MANUFACTURING/ PANELS/ SKIN (STRUCTURAL MEMBER)/ STIFFENING/ SUPPORTS/ T SHAPE/ THERMAL CONTROL COATINGS/ THERMAL INSULATION/ TITANIUM
ABA AUTHOR
ABS THE THERMAL PROTECTION SYSTEM (TPS), DESIGNED FOR INCORPORATION WITH SPACE SHUTTLE ORBITER SYSTEMS, CONSISTS OF ONE PRIMARY HEAT SHIELD THERMALLY AND STRUCTURALLY ISOLATED FROM THE TEST FIXTURE BY EIGHT PERIPHERAL GUARD PANELS, ALL ENCOMPASSING AN AREA OF APPROXIMATELY 12 SQ FT. TPS COMPONENTS INCLUDE TEE-STIFFENED CB 752/R-512E HEAT SHIELDS, BI-METALLIC SUPPORT POSTS, PANEL RETAINERS, AND HIGH TEMPERATURE INSULATION BLANKETS. THE VEHICLE PRIMARY STRUCTURE WAS SIMULATED BY A TITANIUM SKIN, FRAMES, AND STIFFENERS. TEST PROCEDURES, MANUFACTURING PROCESSES, AND METHODS OF ANALYSIS ARE FULLY DOCUMENTED. FOR VOL. 1, SEE N72-30948; FOR VOL. 2, SEE N74-15660.

74N34959*#   ISSUE 24   PAGE 2961   CATEGORY 18   NASA-CR-132507
TFR/1024/7408   NAS1-12967   74/09/00   68 PAGES   UNCLASSIFIED DOCUMENT
A STUDY OF RSI UNDER COMBINED STRESSES
A/KIBLER, J. J.; B/ROSEN, B. W.
MATERIALS SCIENCES CORP., BLUE BELL, PA.   AVAIL.NTIS   HC $3.75

/*INSULATION/*MECHANICAL PROPERTIES/*THERMAL STRESSES/ REENTRY/
SPACE SHUTTLES/ STRESS ANALYSIS/ TEMPERATURE GRADIENTS/ THERMAL CONTROL
COATINGS
ABA AUTHOR
ABS THE BEHAVIOR OF TYPICAL RIGIDIZED SURFACE INSULATION MATERIAL
(RSI) UNDER COMBINED LOADING STATES WAS INVESTIGATED. IN PARTICULAR,
THE THERMAL STRESS STATES INDUCED DURING REENTRY OF THE SPACE SHUTTLE
WERE OF PRIME CONCERN. A TYPICAL RSI TILE WAS ANALYZED FOR REENTRY
THERMAL STRESSES UNDER COMPUTED THERMAL GRADIENTS FOR A MODEL OF THE
RSI MATERIAL. THE RESULTS OF THE THERMAL STRESS ANALYSES WERE THEN USED
TO AID IN DEFINING TYPICAL COMBINED STRESS STATES FOR THE FAILURE
ANALYSIS OF RSI.

74N34347*# ISSUE 23 PAGE 2882 CATEGORY 31 NASA-CR-140274
T169-28-VOL-7 NAS9-10534 73/11/16 64 PAGES UNCLASSIFIED DOCUMENT
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME
7 IMPROVED RADIATOR COATING ADHESIVE TESTS
A/REED, M. W.
LTV AEROSPACE CORP., DALLAS, TEX. (VOUGHT SYSTEMS DIV.)
AVAIL.NTIS HC $6.25
/*ADHESIVES/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS/ HEAT
RADIATORS/ SILICONES/ SILVER/ TEFLON (TRADEMARK)/ THERMAL VACUUM TESTS/
URETHANES
ABA AUTHOR
ABS SILVER/TEFLON THERMAL CONTROL COATINGS HAVE BEEN TESTED ON A
MODULAR RADIATOR SYSTEM PROJECTED FOR USE ON THE SPACE SHUTTLE. SEVEN
CANDIDATE ADHESIVES HAVE BEEN EVALUATED IN A THERMAL VACUUM TEST ON
RADIATOR PANELS SIMILAR TO THE ANTICIPATED FLIGHT HARDWARE
CONFIGURATION. SEVERAL CLASSES OF ADHESIVES BASED ON POLYESTER,
SILICONE, AND URETHANE RESIN SYSTEMS WERE TESTED. THESE INCLUDED
CONTACT ADHESIVES, HEAT CURED ADHESIVES, HEAT AND PRESSURE CURED
ADHESIVES, PRESSURE SENSITIVE ADHESIVES, AND TWO PART PAINT ON OR SPRAY
ON ADHESIVES. THE COATINGS ATTACHED WITH FOUR OF THE ADHESIVES, TWO
SILICONES AND TWO URETHANES, HAD NO CHANGES DEVELOP DURING THE THERMAL
VACUUM TEST. THE TWO SILICONE ADHESIVES, BOTH OF WHICH WERE APPLIED TO
THE SILVER/TEFLON AS TRANSFER LAMINATES TO FORM A TAPE, OFFERED THE
MOST PROMISE BASED ON APPLICATION PROCESS AND THERMAL PERFORMANCE. EACH
OF THE SUCCESSFUL SILICONE ADHESIVES REQUIRED A HEAT AND PRESSURE CURE
TO ADHERE DURING THE CRYOGENIC TEMPERATURE EXCURSION OF THE
THERMAL-VACUUM TEST.

74N34341*# ISSUE 23 PAGE 2881 CATEGORY 31 NASA-CR-140268
T169-28-VOL-2 NAS9-10534 73/10/23 212 PAGES UNCLASSIFIED
DOCUMENT
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME
2 MODULAR RADIATOR SYSTEM TESTS
A/SCHEPS, P. B.; B/HOWELL, H. R.; C/VOSS, F. E.
LTV AEROSPACE CORP., DALLAS, TEX. (VOUGHT SYSTEMS DIV.)
AVAIL.NTIS HC $13.75
/*COOLING SYSTEMS/*HEAT RADIATORS/*SPACE SHUTTLES/ ENVIRONMENTAL
TESTS/ HEAT TRANSFER/ THERMAL CONTROL COATINGS
ABA AUTHOR

ABS TESTS WERE DESIGNED TO INVESTIGATE THE VALIDITY OF THE "MODULAR" APPROACH TO SPACE RADIATOR SYSTEM DESIGN FOR SPACE SHUTTLE AND FUTURE APPLICATIONS BY GATHERING PERFORMANCE DATA ON VARIOUS SYSTEMS COMPRISED OF DIFFERENT NUMBERS OF IDENTICAL PANELS, SUBJECT TO NOMINAL AND EXTREME HEAT LOADS AND ENVIRONMENTS. BOTH ONE-SIDED AND TWO-SIDED RADIATION WAS TESTED, AND ENGINEERING DATA WAS GATHERED ON SIMULATED LOW A/E COATINGS AND SYSTEM RESPONSE TO CHANGES IN OUTLET TEMPERATURE CONTROL POINT. THE RESULTS OF THE TESTING SHOWED SYSTEM STABILITY THROUGHOUT NOMINAL ORBITAL TRANSIENTS, UNREALISTICALLY SKEWED ENVIRONMENTS, FREEZE-THAW TRANSIENTS, AND RAPID CHANGES IN OUTLET TEMPERATURE CONTROL POINT. VARIOUS ALTERNATIVE PANEL PLUMBING ARRANGEMENTS WERE TESTED WITH NO SIGNIFICANT CHANGES IN PERFORMANCE BEING OBSERVED. WITH THE MRS PANELS ARRANGED TO REPRESENT THE SHUTTLE BASELINE SYSTEM, A MAXIMUM HEAT REJECTION OF 76,600 BTU/HR WAS OBTAINED IN SEGMENTED TESTS UNDER THE EXPECTED WORST CASE DESIGN ENVIRONMENTS. TESTING OF AN ALTERNATE SMALLER TWO-SIDED RADIATION CONFIGURATION YIELDED A MAXIMUM HEAT REJECTION OF 52,931 BTU/HR UNDER THE MAXIMUM DESIGN ENVIRONMENTS.

74N34340*# ISSUE 23 PAGE 2881 CATEGORY 31 NASA-CR-140267
T169-28-VOL-1 NAS9-10534 74/04/08 108 PAGES UNCLASSIFIED
DOCUMENT
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING. VOLUME
1 OVERALL SUMMARY
A/HOWELL, H. R.
LTV AEROSPACE CORP., DALLAS, TEX. (VOUGHT SYSTEMS DIV.)
AVAIL.NTIS HC $8.50
/*SPACE SHUTTLE ORBITERS/*TEMPERATURE CONTROL/*THERMAL VACUUM
TESTS/ COOLING SYSTEMS/ HEAT RADIATORS/ THERMAL CONTROL COATINGS/ WATER
ABA AUTHOR

ABS A SUMMARY IS GIVEN OF A SERIES OF THERMAL VACUUM TESTS DESIGNED TO SUPPORT THE DEVELOPMENT OF THE ORBITER ACTIVE THERMAL CONTROL SYSTEM (ATCS) AND INCLUDED TESTING OF A WIDE HEAT LOAD RANGE MODULAR RADIATOR SYSTEM (MRS) CONFIGURED TO THE MARCH 1973 ORBITER BASELINE SYSTEM, A CANDIDATE WEIGHT REDUCING RADIATOR/WATER COOLING SYSTEM, AND A SMALLER RADIATOR SYSTEM WITH A HIGH PERFORMANCE RADIATOR COATING. THE TESTS VERIFIED THE PERFORMANCE OF THE BASELINE SYSTEM AND OBTAINED DETAILED DESIGN INFORMATION FOR APPLICATION OF A WIDE HEAT LOAD RANGE MODULAR RADIATOR SYSTEM TO THE ORBITER. THE TWO CANDIDATE ATCS WEIGHT REDUCING DESIGNS HAVE UNDERGONE EXTENSIVE CONCEPT VERIFICATION TESTING AND THEIR SYSTEM OPERATING CHARACTERISTICS HAVE BEEN DETERMINED IN SUFFICIENT DETAIL FOR APPLICATION TO THE ORBITER. DESIGN INFORMATION HAS BEEN OBTAINED FOR AN INTEGRATED RADIATOR/WATER COOLING SYSTEM THAT PROVIDES FOR VEHICLE HEAT REJECTION AS WELL AS WATER MANAGEMENT OF THE EXCESS FUEL CELL WATER. PROCESSING TECHNIQUES HAVE BEEN DEVELOPED AND VERIFIED FOR THE APPLICATION OF A HIGH PERFORMANCE THERMAL CONTROL COATING TO LARGE RADIATOR AREAS SUBJECTED TO A TEMPERATURE RANGE OF -280 F TO +160 F.

74N30006*#   ISSUE 19   PAGE 2314   CATEGORY 18   NASA-CR-134653
NAS3-17793   74/04/00   102 PAGES   UNCLASSIFIED DOCUMENT

IMPROVED COATING FOR SILICA FIBER BASED CERAMIC REUSABLE SURFACE INSULATION (CRSI)   CONTRACTOR REPORT, 1 JUL. - 31 DEC. 1973

A/ORMISTON, T. J.

GENERAL ELECTRIC CO., PHILADELPHIA, PA.   (RE-ENTRY AND ENVIRONMENTAL SYSTEMS DIV.)   AVAIL.NTIS

HC $8.25

/*CERAMICS/*GLASS FIBERS/*SILICON DIOXIDE/*THERMAL CONTROL COATINGS/ AERODYNAMIC HEATING/ PROTECTIVE COATINGS/ REENTRY/ SPACE SHUTTLES

ABA AUTHOR

ABS A SERIES OF COATINGS WAS DEVELOPED FOR THE SPACE SHUTTLE TYPE SILICA FIBER INSULATION SYSTEM AND CHARACTERIZED FOR OPTICAL AND PHYSICAL PROPERTIES. REENTRY SIMULATION TESTS WERE RUN USING A RADIANT PANEL AND ALSO USING A HYPERSONIC PLASMA ARC. THE COATINGS PRODUCED HAD IMPROVED PHYSICAL AND OPTICAL PROPERTIES AS WELL AS GREATER REUSE CAPABILITY OVER THE GE VERSION OF THE JSC-0042 COATING.

74N29289*#   ISSUE 18   PAGE 2219   CATEGORY 31   NASA-CR-134346
MDC-E1003-VOL-2 JSC-09003-VOL-2   NAS9-13439   74/01/29   778 PAGES
UNCLASSIFIED DOCUMENT

DATA CORRELATION AND ANALYSIS OF ARC TUNNEL AND WIND TUNNEL TESTS OF RSI JOINTS AND GAPS. VOLUME 2   DATA BASE   FINAL REPORT, 16 MAY 1973 - 31 JAN. 1974

A/CHRISTENSEN, H. E.;   B/KIPP, H. W.

MCDONNELL-DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.   AVAIL.NTIS
HC $42.00

/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS/*THERMAL INSULATION/*WIND TUNNEL TESTS/ AEROTHERMODYNAMICS/ HEAT TRANSFER/ SURFACE PROPERTIES/ THERMODYNAMIC PROPERTIES

ABA AUTHOR

ABS WIND TUNNEL TESTS WERE CONDUCTED TO DETERMINE THE AERODYNAMIC HEATING CREATED BY GAPS IN THE REUSABLE SURFACE INSULATION (RSI) THERMAL PROTECTION SYSTEM (TPS) FOR THE SPACE SHUTTLE. THE EFFECTS OF VARIOUS PARAMETERS OF THE RSI ON CONVECTIVE HEATING CHARACTERISTICS ARE DESCRIBED. THE WIND TUNNEL TESTS PROVIDED A DATA BASE FOR ACCURATE ASSESSMENT OF GAP HEATING. ANALYSIS AND CORRELATION OF THE DATA PROVIDE METHODS FOR PREDICTING HEATING IN THE RSI GAPS ON THE SPACE SHUTTLE.

74N29288*#   ISSUE 18   PAGE 2219   CATEGORY 31   NASA-CR-134345
MDC-E1003-VOL-1 JSC-09003-VOL-1   NAS9-13439   74/01/29   230 PAGES
UNCLASSIFIED DOCUMENT

DATA CORRELATION AND ANALYSIS OF ARC TUNNEL AND WIND TUNNEL TESTS OF RSI JOINTS AND GAPS. VOLUME 1   TECHNICAL REPORT   FINAL REPORT, 16 MAY 1973 - 31 JAN. 1974

A/CHRISTENSEN, H. E.;   B/KIPP, H. W.

MCDONNELL-DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.   AVAIL.NTIS
HC $14.50

/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS/*THERMAL INSULATION/*WIND TUNNEL TESTS/ AERTHERMODYNAMICS/ DATA ACQUISITION/ HEAT TRANSFER/ SURFACE PROPERTIES/ THERMODYNAMIC PROPERTIES

ABA AUTHOR
ABS HEAT TRANSFER DATA MEASURED IN GAPS TYPICAL OF THOSE UNDER CONSIDERATION FOR JOINTS IN SPACE SHUTTLE REUSABLE SURFACE INSULATION PROTECTION SYSTEMS HAVE BEEN ASSIMILATED, ANALYZED AND CORRELATED. THE DATA WERE OBTAINED IN FOUR NASA FACILITIES. SEVERAL TYPES OF GAPS WERE INVESTIGATED WITH EMPHASIS ON SIMPLE BUTT JOINTS. GAP WIDTHS RANGED FROM 0.07 TO 0.7 CM AND DEPTHS RANGED FROM 1 TO 6 CM. LAMINAR, TRANSITIONAL AND TURBULENT BOUNDARY LAYER FLOWS OVER THE GAP OPENING WERE INVESTIGATED. THREE-DIMENSIONAL HEATING VARIATIONS WERE OBSERVED WITHIN GAPS IN THE ABSENCE OF EXTERNAL FLOW PRESSURE GRADIENTS. HEAT TRANSFER CORRELATION EQUATIONS WERE OBTAINED FOR SEVERAL OF THE TESTS. THERMAL PROTECTION SYSTEM PERFORMANCE WITH AND WITHOUT GAPS WAS COMPARED FOR A REPRESENTATIVE SHUTTLE ENTRY TRAJECTORY.

74N22502*# ISSUE 13 PAGE 1605 CATEGORY 31 NASA-CR-132428 LMSC-D157398 NAS1-11153 72/06/26 66 PAGES UNCLASSIFIED DOCUMENT
STRUCTURAL EVALUATION OF CANDIDATE SPACE SHUTTLE THERMAL PROTECTION SYSTEMS FINAL REPORT
A/BURNS, A. B.
LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF. AVAIL.NTIS HC $6.50
/*COMPOSITE MATERIALS/*SILICON CARBIDES/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS/*THERMAL PROTECTION/ ADHESIVE BONDING/ MATERIALS TESTS/ MECHANICAL PROPERTIES/ THERMODYNAMIC PROPERTIES
ABA AUTHOR
ABS THE CHARACTERISTICS AND DEVELOPMENT OF A LIGHTWEIGHT REUSABLE THERMAL PROTECTION SYSTEM FOR THE SPACE SHUTTLE ARE DISCUSSED. THE TEST ARTICLES CONSISTED OF METALLIC SUBSTRATES WITH UPPER SURFACES COVERED WITH ALL-SILICA, REUSABLE, SURFACE INSULATION MATERIAL. THE MATERIAL IS PROCESSED IN THE FORM OF TILES. THE EXTERNAL SURFACES OF THE TILES ARE PROVIDED WITH A COATING SYSTEM WHICH CONSISTS OF A BOROSILICATE COATING WITH A SILICON CARBIDE EMITTANCE AGENT AND IMPREGNATION WITH A HYDROPHOBIC AGENT. THE FINISHED TILES ARE ATTACHED TO THE METAL SUBSTRATE BY ADHESIVE BONDING. CHARTS AND GRAPHS OF THE PROPERTIES OF THE MATERIAL ARE PROVIDED.

74N10271* ISSUE 1 PAGE 35 CATEGORY 21 72/00/00 20 PAGES UNCLASSIFIED DOCUMENT
A STUDY OF ABLATOR PRODUCIBILITY AND REFURBISHMENT METHODS
A/KING, W. E., JR.
MARTIN MARIETTA CORP., DENVER, COLO.
IN NASA. GODDARD SPACE FLIGHT CENTER SPACE SIMULATION, 7TH P 585-604 (SEE N74-10232 01-11)
/*ABLATIVE MATERIALS/*HEAT SHIELDING/*PRODUCTION ENGINEERING/*SPACE SHUTTLE ORBITERS/ INSTALLING/ REPLACING/ SPACE ENVIRONMENT SIMULATION/ THERMAL CONTROL COATINGS
ABA AUTHOR
ABS FABRICATION, INSTALLATION, AND REMOVAL METHODS ARE STUDIED FOR ABLATIVE THERMAL PROTECTION SYSTEMS BY USING A LIFTING BODY SPACE VEHICLE AIRFRAME AS A FULL SIZE DEMONSTRATION TEST BED FOR PROTOTYPE HARDWARE.

74N10270* ISSUE 1 PAGE 35 CATEGORY 33 NAS1-11592 73/00/00 15 PAGES UNCLASSIFIED DOCUMENT

ABLATIVE HEAT SHIELD DESIGN FOR SPACE SHUTTLE --- REUSABLE CERAMIC THERMAL INSULATION SYSTEM

A/SEIFERTH, R. W.

MARTIN MARIETTA CORP., DENVER, COLO.

IN NASA. GODDARD SPACE FLIGHT CENTER SPACE SIMULATION, 7TH P 567-581 (SEE N74-10232 01-11)

/*ABLATIVE MATERIALS/*CERAMIC COATINGS/*HEAT SHIELDING/*SPACE ENVIRONMENT SIMULATION/ COMPOSITE MATERIALS/ COST ESTIMATES/ SPACE SHUTTLE ORBITERS/ THERMAL CONTROL COATINGS

ABA AUTHOR

ABS ABLATOR HEAT SHIELD CONFIGURATION OPTIMIZATION STUDIES WERE CONDUCTED FOR THE ORBITER. ABLATOR AND RSI TRAJECTORIES FOR DESIGN STUDIES WERE SHAPED TO TAKE ADVANTAGE OF THE LOW CONDUCTANCE OF CERAMIC RSI AND HIGH TEMPERATURE CAPABILITY OF ABLATORS. COMPARATIVE WEIGHTS WERE ESTABLISHED FOR THE RSI SYSTEM AND FOR DIRECT BOND AND MECHANICALLY ATTACHED ABLATOR SYSTEMS. ABLATOR SYSTEM COSTS WERE DETERMINED FOR FABRICATION, INSTALLATION AND REFURBISHMENT. COST PENALTIES WERE ASSIGNED FOR PAYLOAD WEIGHT PENALTIES, IF ANY. THE DIRECT BOND ABLATOR IS LOWEST IN WEIGHT AND COST. A MECHANICALLY ATTACHED ABLATOR USING A MAGNESIUM SUBPANEL IS HIGHLY COMPETITIVE FOR BOTH WEIGHT AND COST.

74N10265* ISSUE 1 PAGE 34 CATEGORY 17 73/00/00 17 PAGES UNCLASSIFIED DOCUMENT

RESPONSE OF CANDIDATE METALLIC SPACE SHUTTLE MATERIALS TO SIMULATE REENTRY ENVIRONMENTS --- THERMAL CYCLING TESTS ON COATED NIOBIUM ALLOYS

A/GRINBERG, I. M.; B/BARTLETT, E. S.; C/LUCE, R. G.

BATTELLE COLUMBUS LABS., OHIO.

IN NASA. GODDARD SPACE FLIGHT CENTER SPACE SIMULATION, 7TH P 489-505 (SEE N74-10232 01-11)

/*NIOBIUM ALLOYS/*REENTRY EFFECTS/*THERMAL CYCLING TESTS/ SPACE ENVIRONMENT SIMULATION/ SPACE SHUTTLES/ THERMAL CONTROL COATINGS

ABA AUTHOR

ABS COATED COLUMBIUM ALLOYS WERE EVALUATED IN AN EXPERIMENTAL PROGRAM TO DETERMINE THEIR DEGRADATION AND REUSE CAPABILITY FOR THE THERMAL PROTECTION SYSTEM OF THE SPACE SHUTTLE. INTENTIONALLY DEFECTED SPECIMENS WERE THERMALLY CYCLED IN EITHER AN ARC HEATED WIND TUNNEL OR STATIC FURNACE ENVIRONMENT. THE RELATIVE EFFECT OF THE ENVIRONMENTAL EXPOSURES ON DEFECT GROWTH, MECHANICAL PROPERTIES, AND SURFACE EMITTANCE DEGRADATION WAS DETERMINED. TECHNIQUES USED TO CHARACTERIZE THE ARC HEATED WIND TUNNEL ENVIRONMENT AND TO DETERMINE THE THERMAL RESPONSE OF THE SPECIMENS DURING THE EXPOSURES ARE DESCRIBED.

73N33487* ISSUE 24 PAGE 2941 CATEGORY 18 73/09/00 57 PAGES UNCLASSIFIED DOCUMENT

CHARACTERIZATION OF RSI COATING

(THERMAL CYCLING EFFECTS ON PROPERTIES OF SILICA, MULLITE, AND ALUMINO-SILICATE INSULATION COATINGS)

A/MILLER, A. D.; B/GAROFALINI, S. H.; C/SMISER, L. W.; D/MUELLER,

J. I.
WASHINGTON UNIV., SEATTLE. (CERAMIC ENGINEERING DIV.)
IN NASA. AMES RES. CENTER SYMP. ON REUSABLE SURFACE INSULATION FOR SPACE SHUTTLE, VOL. 2 P 793-850 (SEE N73-33475 24-18)
/*ALUMINUM SILICATES/*MULLITES/*SILICATES/*THERMAL CONTROL COATINGS/*THERMAL CYCLING TESTS/ CERAMIC COATINGS/ COMPOSITE MATERIALS/ SPACE SHUTTLE ORBITERS/ THERMAL INSULATION
ABA G.G.
ABS X-RAY DIFFRACTION ANALYSES ON MULLITE, SILICA, AND CERAMIC MULLITE FIBER COATING MATERIALS TO INVESTIGATE THE EFFECTS OF THERMAL CYCLING, SHOW THAT CERAMIC MULLITE FIBER COATING POROSITY IS LITTLE AFFECTED BY CYCLING TO 1250 C AND THAT MATERIAL PORES ARE MOSTLY SMALLER THAN 15 NM. SOME MULLITE COATINGS EXPERIENCE A SLIGHT INCREASE IN CRYSTOBALITE WITH SOMEWHAT INCREASED POROSITY. SILICA COATINGS SHOW A MARKED TENDENCY TO PRECIPITATE CRISTOBALITE WITH INCREASED POROSITY AND DIMENSIONAL INSTABILITY.

73N33469* ISSUE 24 PAGE 2939 CATEGORY 18 73/09/00 34 PAGES
UNCLASSIFIED DOCUMENT
OPTIMIZATION OF REI-MULLITE PHYSICAL PROPERTIES
(HAFNIUM PIGMENTATION FOR MULLITE COMPOSITE THERMOPHYSICAL OPTIMIZATION)
A/TANZILLI, R. A.; B/MUSIKANT, S.; C/BOLINGER, P. N.; D/BRAZEL, J. P.
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
IN NASA. AMES RES. CENTER SYMP. ON REUSABLE SURFACE INSULATION FOR SPACE SHUTTLE, VOL. 1 P 277-260 (SEE N73-33461 24-18)
/*COMPOSITE MATERIALS/*HAFNIUM/*MULLITES/*THERMAL INSULATION/ SPACE SHUTTLE ORBITERS/ THERMAL CONTROL COATINGS/ THERMOPHYSICAL PROPERTIES
ABA AUTHOR
ABS MICROMECHANICAL AND THERMAL MODELING STUDIES PROVE THAT CERAMIC FIBER MULLITE MATERIALS IS THE ONLY SYSTEM CAPABLE OF SHUTTLE THERMAL PROTECTION TO 1644 K. HAFNIA PIGMENTATED MULLITE SURFACE COATINGS MEET BOTH ORBITAL AND REENTRY THERMAL RADIATIVE REQUIREMENTS FOR REUSE WITHOUT REFURBISHMENT. THERMAL AND MECHANICAL MODELS SHOW GROWTHS POTENTIALS ASSOCIATED WITH THE MULLITE SYSTEM FOR A FACTOR OF 2 IMPROVEMENT IN MECHANICAL PROPERTIES, AND A FACTOR OF 2 TO 3 REDUCTION IN THERMAL CONDUCTIVITY.

73N33467* ISSUE 24 PAGE 2939 CATEGORY 18 73/09/00 42 PAGES
UNCLASSIFIED DOCUMENT
SILICA REUSABLE SURFACE INSULATION IMPROVEMENT RESEARCH
(SILICA FIBER MATERIALS FOR SURFACE INSULATION OF SPACE SHUTTLE ORBITERS)
A/GOLDSTEIN, H. E.; B/SMITH, M.; C/LEISER, D. G.; D/KATVALA, V.; E/STEWART, D.
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
IN ITS SYMP. ON REUSABLE SURFACE INSULATION FOR SPACE SHUTTLE, VOL. 1 P 155-196 (SEE N73-33461 24-18)
/*COMPOSITE MATERIALS/*GLASS FIBERS/*SILICA GLASS/*THERMAL INSULATION/ MECHANICAL PROPERTIES/ PRODUCTION ENGINEERING/ SPACE

SHUTTLE ORBITERS/ THERMAL CONTROL COATINGS
ABA G.G.
ABS FIBER CHARACTERIZATION, FABRICATION PROCESSES, PHYSICAL PROPERTIES, AND THERMAL RESPONSES ARE INVESTIGATED TO IMPROVE SILICA REUSABLE SURFACE INSULATION TILES. CRITERIA FOR FIBER SELECTION ON THE BASIS OF CHEMICAL COMPOSITION, SHRINKAGE, AND DEVITRIFICATION HAVE BEEN DEFINED AND A SIMPLE PROCESS FOR FABRICATING SILICA SURFACE INSULATION MATERIALS HAS BEEN DEVELOPED THAT PRODUCES ONLY 5% SHRINKAGE AND NO DEVITRIFICATION OF TILES AT 1533 K IN TEN HOURS. ANISOTROPIC TILE WITH IMPROVED WEAK DIRECTION STRENGTH HAS BEEN FABRICATED USING CONVENTIONAL MOLDING TECHNIQUES.

73N33466* ISSUE 24 PAGE 2939 CATEGORY 18 73/09/00 47 PAGES UNCLASSIFIED DOCUMENT
MAR-SI, MARTIN SURFACE INSULATION
(ALUMINA SILICATE BASED COMPOSITE MATERIALS FOR SPACE SHUTTLE HEAT SHIELDING SYSTEM)
A/PLANK, P. P.; B/FELDMAN, A.; C/MIILLER, W. C.; D/CREEDON, J. F.; E/TOTH, J. M., JR.
MARTIN MARIETTA CORP., DENVER, COLO.
IN NASA. AMES RES. CENTER SYMP. ON REUSABLE SURFACE INSULATION FOR SPACE SHUTTLE, VOL. 1 P 1C7-153 (SEE N73-33461 24-18)
/*ALUMINUM SILICATES/*COMPOSITE MATERIALS/*OXIDES/*THERMAL INSULATION/ HEAT SHIELDING/ PRODUCTION ENGINEERING/ SPACE SHUTTLE ORBITERS/ THERMAL CONTROL COATINGS
ABA G.G.
ABS THE DEVELOPMENT OF AN ALUMINA/SILICATE BASED COMPOSITE MATERIAL FOR SPACE SHUTTLE REUSABLE SURFACE INSULATION IS REPORTED. PHYSICAL PROPERTY DETERMINATIONS, ENVIRONMENTAL TESTING, DESIGN ANALYSIS, AND PROJECTED COSTS FOR A THERMAL PROTECTION SYSTEM ARE OUTLINED.

73N19953# ISSUE 10 PAGE 1224 CATEGORY 33 TASS-72-Z-1095 ELDO-CTR-17/6/58 72/07/12 128 PAGES UNCLASSIFIED DOCUMENT
INVESTIGATION OF NON METALLIC THERMAL PROTECTION PANELS
(NON-METALLIC THERMAL PROTECTION PANELS FOR SPACE SHUTTLES) FINAL REPORT
FIAT S.P.A., TURIN (ITALY). (AVIATION DIV.) AVAIL.NTIS HC $8.50
/*SPACE SHUTTLES/*THERMAL PROTECTION/ PANELS/ REFRACTORY MATERIALS/ RIGID STRUCTURES/ THERMAL CONTRCL COATINGS/ ZIRCONIUM OXIDES
ABA ESRO
ABS THEORETICAL INVESTIGATIONS WERE CARRIED OUT TO DEFINE GUIDELINES FOR THE SELECTION OF SUITABLE THERMAL PROTECTION MATERIALS. A MATHEMATICAL MODEL WAS ESTABLISHED IN ORDER TO CORRELATE KNOWN THERMOPHYSICAL PROPERTIES OF MATERIALS WITH THERMAL PROTECTION WEIGHT FOR THE ASSIGNED MISSION. AS A RESULT, ZIRCONIUM OXIDE COMPONENTS IN THE FORM OF MATS WERE SELECTED FOR EXPERIMENTAL RESEARCH. RIGID SAMPLES WERE CONSTRUCTED WHICH SHOW PROMISING PROPERTIES AND A COATING COMPATIBLE WITH THE SYSTEM WAS SELECTED.

73N10893*#   ISSUE 1   PAGE 108   CATEGORY 31   NASA-CR-128607
MDC-G3678   NAS9-12180   72/07/00   136 PAGES   UNCLASSIFIED DOCUMENT
EVALUATION OF NONDESTRUCTIVE TESTING TECHNIQUES FOR THE SPACE SHUTTLE NONMETALLIC THERMAL PROTECTION SYSTEM
(NONDESTRUCTIVE ANALYSIS TECHNIQUES FOR DETECTION OF DEFECTS IN RIGIDIZED SURFACE INSULATICN FOR SPACE SHUTTLE THERMAL PROTECTION)
A/TIEDE, D. A.
MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON BEACH, CALIF.
AVAIL.NTIS   HC $9.00
/*NONDESTRUCTIVE TESTS/*SPACE SHUTTLES/*THERMAL PROTECTION/ TENSILE STRENGTH/ THERMAL CONTROL COATINGS/ ULTRASONIC TESTS/ X RAY ANALYSIS
ABA AUTHOR
ABS A PROGRAM WAS CONDUCTED TO EVALUATE NONDESTRUCTIVE ANALYSIS TECHNIQUES FOR THE DETECTION OF DEFECTS IN RIGIDIZED SURFACE INSULATION (A CANDIDATE MATERIAL FOR THE SPACE SHUTTLE THERMAL PROTECTION SYSTEM). UNCOATED, COATED, AND COATED AND BONDED SAMPLES WITH INTERNAL DEFECTS (VOIDS, CRACKS, DELAMINATIONS, DENSITY VARIATIONS, AND MOISTURE CONTENT), COATING DEFECTS (HOLES, CRACKS, THICKNESS VARIATIONS, AND LOSS OF ADHESION), AND BCNDLINE DEFECTS (VOIDS AND UNBONDS) WERE INSPECTED BY X-RAY RADIOGRAPHY, ACOUSTIC, MICROWAVE, HIGH-FREQUENCY ULTRASONIC, BETA BACKSCATTER, THERMAL, HOLOGRAPHIC, AND VISUAL TECHNIQUES. THE DETECTABILITY OF EACH TYPE OF DEFECT WAS DETERMINED FOR EACH TECHNIQUE (WHEN APPLICABLE). A POSSIBLE RELATICNSHIP BETWEEN MICROWAVE REFLECTION MEASUREMENTS (OR X-RAY-RADIOGRAPHY DENSITY MEASUREMENTS) AND THE TENSILE STRENGTH WAS ESTABLISHED. A POSSIBLE APPROACH FOR IN-PROCESS INSPECTION USING A COMBINATION OF X-RAY RADIOGRAPHY, ACOUSTIC, MICROWAVE, AND HOLOGRAPHIC TECHNIQUES WAS RECOMMENDED.

72N30948*#   ISSUE 21   PAGE 2901   CATEGORY 33   NASA-CR-112119
NAS1-9793   72/06/00   325 PAGES   UNCLASSIFIED DOCUMENT
EVALUATION OF COATED COLUMBIAN ALLOY HEAT SHIELDS FOR SPACE SHUTTLE THERMAL PROTECTION SYSTEM APPLICATION. VOLUME 1 PHASE 1 - ENVIRONMENTAL CRITERIA AND MATERIAL CHARACTERIZATION, OCTOBER 1970 - MARCH 1972
(ENVIRONMENTAL TESTS FOR EVALUATING SILICON COATED NIOBIUM ALLOYS FOR SPACE SHUTTLE HEAT SHIELD APPLICATION)
A/BLACK, W. E.
GENERAL DYNAMICS/CONVAIR, SAN DIEGO, CALIF.   (AEROSPACE DIV.)
AVAIL.NTIS   HC $18.25
/*HEAT SHIELDING/*NIOBIUM ALLOYS/*SILICON/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS/ SPACE ENVIRONMENT SIMULATION/ SPACECRAFT SHIELDING/ THERMAL INSULATION
ABA G.G.
ABS THE STUDIES PRESENTED ARE DIRECTED TOWARD ESTABLISHING CRITERIA FOR A NIOBIUM ALLOY THERMAL PROTECTION SYSTEM FOR THE SPACE SHUTTLE. EVALUATION OF THREE NIOBIUM ALLOYS AND TWO SILICON COATINGS FOR HEAT SHIELD CONFIGURATIONS CULMINATED IN THE SELECTION OF TWO COATING/SUBSTRATE COMBINATIONS FOR ENVIRONMENTAL CRITERIA AND MATERIAL CHARACTERIZATION TESTS. SPECIMENS WERE EXPOSED TO BOOST AND REENTRY TEMPERATURES, PRESSURE, AND LOADS SIMULATING A SPACE SHUTTLE ORBITER FLIGHT PROFILE.

72N21952*# ISSUE 12 PAGE 1682 CATEGORY 33 NASA-TM-X-68044
E-6881 72/00/00 16 PAGES UNCLASSIFIED DOCUMENT
OPTICAL PROPERTIES OF THERMAL CONTROL COATING CONTAMINATED BY MMH/N2O4 5-POUND THRUSTER IN A VACUUM ENVIRONMENT WITH SOLAR SIMULATION
(MEASUREMENT OF SOLAR ABSORPTION AND THERMAL EMITTANCE PROPERTIES OF SELECTED THERMAL CONTROL COATINGS EXPOSED TO EXHAUST OF THRUSTER ENGINE)
A/SOMMERS, R. D.; B/RAQUET, C. A.; C/CASSIDY, J. F.
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO. AVAIL.NTIS
PRESENTED AT 7TH THERMOPHYS. CONF., SAN ANTONIO, 10-12 APR. 1972; SPONSORED BY AIAA
/*AEROSPACE ENVIRONMENTS/*PROTECTIVE COATINGS/*THERMAL CONTROL COATINGS/*THERMAL EMISSION/ ENVIRONMENTAL TESTS/ TEMPERATURE MEASUREMENT/ THERMODYNAMIC PROPERTIES
ABA AUTHOR
ABS CAT-A-LAC BLACK, AND S13G THERMAL CONTROL COATINGS WERE EXPOSED TO THE EXHAUST OF A THRUSTER IN A SIMULATED SPACE ENVIRONMENT. VACUUM WAS MAINTAINED AT LESS THAN 10 TO THE MINUS 5TH POWER TORR DURING THRUSTER FIRING IN THE LIQUID HELIUM COOLED FACILITY. THE THRUSTER WAS FIRED IN A 50-MILLISECOND PULSE MODE AND THE ACCUMULATED FIRING TIME WAS 224 SECONDS. SOLAR ABSORPTANCE (ALPHA SUB S) AND THERMAL EMITTANCE (SIGMA) OF THE COATINGS WERE MEASURED IN-SITU AT INTERVALS OF 300 PULSES. A CALORIMETRIC TECHNIQUE WAS USED TO MEASURE ALPHA SUB S AND SIGMA. THE TESTS, TECHNIQUE, AND TEST RESULTS ARE PRESENTED. THE CAT-A-LAC BLACK COATINGS SHOWED NO CHANGE IN ALPHA SUB S OR SIGMA. THE S13G SHOWED UP TO 25 PERCENT INCREASE IN ALPHA SUB S BUT NO CHANGE IN SIGMA.

72N17670*# ISSUE 8 PAGE 1092 CATEGORY 29 NAS5-10392 72/01/00
9 PAGES UNCLASSIFIED DOCUMENT
LOW-ENERGY PARTICLE RADIATION ENVIRONMENT AT SYNCHRONOUS ALTITUDE
(ANALYSIS OF LOW ENERGY PARTICLE RADIATION ENVIRONMENT IN SPACE AND EFFECTS ON THERMAL CONTROL SURFACES OF UNMANNED SATELLITES)
A/SHELLEY, E. G.; B/LENS, S. K.
LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF. (RESEARCH LAB.)
AVAIL.NTIS HC $10.00/MF $0.95
IN NASA, WASHINGTON PROC. OF THE NATL. SYMP. ON NAT. AND MANMADE RADIATION IN SPACE P 530-538 (SEE N72-17601 08-22) SUPPORTED IN PART BY THE LOCKHEED INDEPENDENT RES. PROGRAM
/*AEROSPACE ENVIRONMENTS/*CHARGED PARTICLES/*ELECTRON DENSITY (CONCENTRATION)/ ATS 5/ CONFERENCES/ THERMAL CONTROL COATINGS
ABA AUTHOR
ABS THE DEGRADATION OF THERMAL CONTROL COATINGS OF SATELLITES DUE TO THE EFFECTS OF LOW ENERGY CHARGED PARTICLES IN THE SPACE ENVIRONMENT IS DISCUSSED. DATA OBTAINED FROM ATS-5 SATELLITE MEASUREMENT OF PROTON AND ELECTRON FLUXES ARE PRESENTED. THE VARIATIONS IN ELECTRON DENSITY, PROTON DENSITY, AND MAGNETIC ACTIVITY ARE PRESENTED TO SHOW CORRELATIONS WHICH EXIST BETWEEN THESE SPACE FACTORS.

71N38068*#   ISSUE 24   PAGE 3934   CATEGORY 17   NASA-TM-X-62092
71/10/15 32 PAGES   UNCLASSIFIED DOCUMENT
ARC JET TESTS OF METALLIC TPS MATERIALS
(ARC JETS TESTS OF THORIA DISPERSED NICKEL BASE ALLOYS AND COBALT BASE ALLOYS FOR SPACE SHUTTLE METALLIC THERMAL PROTECTION SYSTEM)
A/CENTOLANZI, F. J.; B/PROBST, H. B.; C/LOWELL, C. E.; D/ZIMMERMAN, N. B.
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.   AVAIL.NTIS
PREPARED JOINTLY WITH NASA. LEWIS RES. CENTER, CLEVELAND
PRESENTED AT THE SPACE SHUTTLE MATER. CONF., HUNTSVILLE, ALA., 5-7 OCT. 1971; SPONSORED BY THE SOC. OF AEROSPACE MATER. AND PROCESS ENGR.
/*ARC HEATING/*COBALT ALLOYS/*HIGH TEMPERATURE TESTS/*METAL COATINGS/*NICKEL ALLOYS/*SPACE SHUTTLES/*THERMAL CONTROL COATINGS/ ELECTRON MICROSCOPES/ METALLOGRAPHY/ X RAY DIFFRACTION

71N32280*#   ISSUE 19   PAGE 3065   CATEGORY 9   NASA-CR-1786
NASW-1568   71/06/00 194 PAGES   UNCLASSIFIED DOCUMENT
RADIATION EFFECTS DESIGN HANDBOOK. SECTION 2 - THERMAL-CONTROL COATINGS
(THERMAL CONTROL COATINGS - RADIATION EFFECTS DESIGN HANDBOOKS)
A/BROADWAY, N. J.
BATTELLE MEMORIAL INST., COLUMBUS, OHIO.   (RADIATION EFFECTS INFORMATION CENTER.)   AVAIL.NTIS   AVAIL- NTIS
WASHINGTON   NASA
/*EXTRATERRESTRIAL RADIATION/*HANDBOOKS/*RADIATION EFFECTS/*THERMAL CONTROL COATINGS/ CHARGED PARTICLES/ NUCLEAR RADIATION/ ULTRAVIOLET RADIATION

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
EVALUATION OF ELASTOMERIC SILICONE MATERIALS FOR THERMAL PROTECTION OF THE SPACE SHUTTLE SOLID ROCKET BOOSTERS AND CRYOGENIC CYLINDERS
UNCLASSIFIED AUGUST 5, 1976 / APRIL 4, 1977
TM A/SMITH, A. D. A/AT01
PI B/HILTZ, A. A.
REPORTS EXPECTED
/*ABLATIVE MATERIALS/*CRYOGENICS/*ELASTOMERS/*EXTERNAL TANKS/*PREFORMS/*PROTECTIVE COATINGS/*SILICONE RUBBER/*SPACE SHUTTLE BOOSTERS/*SPRAYING/*STORAGE TANKS/*THERMAL CONTROL COATINGS/*THERMAL PROTECTION

75K11475 (MOD-012)NAS8-26791
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
IIT RESEARCH INST., CHICAGO, ILL.
DEVELOPMENT OF SPACE-STABLE THERMAL CONTROL COATINGS FOR LARGE SPACE VEHICLES EVALUATION OF THERMAL-CONTROL PIGMENT SAMPLES
UNCLASSIFIED JANUARY 4, 1971 / DECEMBER 31, 1975
PI B/GILLIGAN, J. E., B/HARADA, Y.
REPORTS EXPECTED
INCOMPLETE PROCESSING
/*COATINGS/*PROTECTIVE COATINGS/*SPACE TRANSPORTATION/*THERMAL CONTROL COATINGS/*THERMAL PROTECTION/*ZINC OXIDES

75X73112# AD-922801 GIDEP-347.65.00.00-CL-01 SPAR-R.555 73/05/00 27 PAGES UNCLASSIFIED DOCUMENT GOVT. AGCY
CTS THERMAL CONTROL SURFACE PROPERTIES MEASUREMENT
A/BELL, J. F.
SPAR AEROSPACE PRODUCTS LTD., MALTON (ONTARIO).
/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ ABSORPTIVITY/ EMISSIVITY/ GLASS FIBERS/ GOLD COATINGS/ INFRARED REFLECTION/ KAPTON (TRADEMARK)/ SOLAR CELLS/ TEFLON (TRADEMARK)

76A11724* ISSUE 2 PAGE 156 CATEGORY 18 NAS5-21100 75/11/00 8 PAGES UNCLASSIFIED DOCUMENT
ATS-6 SPACECRAFT SURFACE TREATMENT FOR THE CONTROL OF ELECTRICAL DISCHARGES
A/KEISER, B. E.
IEEE TRANSACTIONS ON ELECTROMAGNETIC COMPATIBILITY, VOL. EMC-17, NOV. 1975, P. 226-233.
/*ATS 6/*ELECTRIC DISCHARGES/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ BOOMS (EQUIPMENT)/ SOLAR ARRAYS/ SPACECRAFT MODULES/ SURFACE FINISHING
ABA B.J.
ABS THE ATS-6 HAS BEEN SUBJECT TO POTENTIAL CHARGES AS HIGH AS 11,000 VOLTS BASED ON ONBOARD MEASUREMENTS. THUS, SPECIAL MEASURES WERE

REQUIRED TO PROTECT THE SPACECRAFT SURFACE AREAS, - PRIMARILY THE EARTH VIEWING MODULE, THE REFLECTOR SUPPORT TRUSS, AND THE SOLAR ARRAY BOOM THAT WERE SPECIALLY PROCESSED FOR THERMAL CONTROL - FROM ELECTRICAL DISCHARGES WHOSE ACCOMPANYING FIELDS COULD DESTROY SENSITIVE RECEIVING CIRCUITS. THE PAPER DESCRIBES THERMAL BLANKET GROUNDING CRITERIA AND TECHNIQUES APPLIED TO PREVENT UNDESIRED DISCHARGE EFFECTS, AND DISCUSSES THE DISTURBANCE RATE FROM STATIC DISCHARGE IN ORBIT.

75A43990# ISSUE 22 PAGE 3224 CATEGORY 18 74/00/00 8 PAGES
UNCLASSIFIED DOCUMENT
CRYOCONTAMINATION OF OPTICAL SOLAR REFLECTORS AND MIRRORS --- SATELLITE THERMAL CONTROL DEGRADATION
A/LIU, C.-K.; B/TIEN, C. L. A/(LOCKHEED RESEARCH LABORATORIES, PALO ALTO, CALIF.); B/(CALIFORNIA, UNIVERSITY, BERKELEY, CALIF.)
IN CRYOGENIC ENGINEERING CONFERENCE, ATLANTA, GA., AUGUST 8-10, 1973, PROCEEDINGS. (A75-43976 22-31) NEW YORK, PLENUM PRESS, 1974, P. 474-481. RESEARCH SUPPORTED BY THE LOCKHEED MISSILES AND SPACE INDEPENDENT RESEARCH AND DEVELOPMENT PROGRAM.
/*CRYODEPOSITS/*MIRRORS/*OPTICAL REFLECTION/*SOLAR REFLECTORS/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ SATELLITE LIFETIME/ SPACECRAFT CONTAMINATION/ SPECTRAL REFLECTANCE
ABA S.J.M.
ABS A PREVIOUS THEORETICAL STUDY ON TRANSMITTANCE ATTENUATION DUE TO SOLID CRYODEPOSIT IN OPTICAL SYSTEMS, EMPLOYING THE ENERGY METHOD (A METHOD BASED ON AN APPROXIMATION NEGLECTING THE WAVE INTERFERENCE EFFECT BUT CONSIDERING MULTIPLE INTERNAL REFLECTION OF THE INCIDENT BEAM), IS EXTENDED TO PREDICTING THE SPECTRAL REFLECTIVE CHARACTERISTICS OF CRYODEPOSIT ON OPAQUE SUBSTRATES. AS AN EXAMPLE, THE EFFECT OF CRYOCONTAMINATION ON THE FLEXIBLE OPTICAL SOLAR REFLECTOR (OSR) IS INVESTIGATED, AGAIN BY THE ENERGY METHOD. SOLAR ABSORPTANCE AND THERMAL EMITTANCE ARE DETERMINED FOR FEP TEFLON/AG AND FEP/AL SUBSTRATES WITH AND WITHOUT CO2 AND H2O CRYOCONTAMINATION.

75A39222# ISSUE 19 PAGE 2801 CATEGORY 34 74/00/00 164 PAGES
IN GERMAN UNCLASSIFIED DOCUMENT
MIRROR SURFACE SYSTEMS FOR THE SOLUTION OF THERMAL PROBLEMS OF SPACE TECHNOLOGY --- GERMAN BOOK
A/LORENZ, W.
BRAUNSCHWEIG, TECHNISCHE UNIVERSITAET, FAKULTAET FUER MASCHINENBAU UND ELEKTROTECHNIK, DR.-ING. DISSERTATION, 1974. 164 P. IN GERMAN.
/*HEAT SHIELDING/*MIRRORS/*SPACECRAFT RADIATORS/*SPACECRAFT SHIELDING/*SURFACE TEMPERATURE/*THERMAL CONTROL COATINGS/ BOUNDARY VALUE PROBLEMS/ DIFFERENTIAL EQUATIONS/ FOURIER SERIES/ HEAT TRANSFER/ SOLAR CELLS/ SOLAR RADIATION/ SPACECRAFT DESIGN
ABA G.R.
ABS AN INVESTIGATION HAS BEEN CONDUCTED CONCERNING THE ABILITY OF A REFLECTING SURFACE SYSTEM TO SATISFY A NUMBER OF REQUIREMENTS RELATED TO THE SUITABLE CONTROL OF SPACECRAFT TEMPERATURE DURING AN EXPOSURE TO SOLAR RADIATION. THE CONFIGURATIONS CONSIDERED IN THE INVESTIGATION ARE SIMILAR TO THE HELIOS CONFIGURATION. A RELATED OBJECTIVE OF THE INVESTIGATION WAS THE DEVELOPMENT OF THE THEORETICAL FOUNDATIONS NEEDED FOR A USE OF THE REFLECTING SURFACE SYSTEM AS A CONSTRUCTIONAL ELEMENT

IN THE DESIGN OF FUTURE SPACECRAFT.

75A32906# ISSUE 15 PAGE 2148 CATEGORY 27 AIAA PAPER 75-668
F33615-68-C-1412 75/05/00 7 PAGES UNCLASSIFIED DOCUMENT
FABRIC COATINGS - A NEW TECHNIQUE FOR SPACECRAFT PASSIVE TEMPERATURE CONTROL
A/EAGLES, A. E.; B/BABJAK, S. J.; C/WEAVER, J. H. A/(GENERAL ELECTRIC CO., KING OF PRUSSIA, PA.); C/(USAF, MATERIALS LABORATORY, WRIGHT-PATTERSON AFB, OHIO)
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, THERMOPHYSICS CONFERENCE, 10TH, DENVER, COLO., MAY 27-29, 1975, 7 P.
/*ANTIREFLECTION COATINGS/*FABRICS/*SILICON DIOXIDE/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ OPTICAL PROPERTIES/ OUTGASSING/ RADIATION DAMAGE/ SPECTRAL REFLECTANCE/ TEMPERATURE CONTROL/ THERMAL CYCLING TESTS
ABA (AUTHOR)
ABS FABRICS FOR PASSIVE TEMPERATURE CONTROL OF SPACECRAFT HAVE BEEN DEVELOPED AND DEMONSTRATED WHICH HAVE RADIATIVE PROPERTIES SIMILAR TO THOSE PREVIOUSLY AVAILABLE FROM BOTH WHITE AND GRAY THERMAL CONTROL PAINTS, BUT PROVIDE GREATER STABILITY IN THE ULTRAVIOLET AND PARTICULATE RADIATION ENVIRONMENTS OF SPACE. THESE FABRICS, CONSTRUCTED FROM SIO2 YARN, PRODUCE LITTLE IF ANY OUTGASSING PRODUCTS, ARE RF-TRANSPARENT, AND ARE FLEXIBLE ENOUGH TO USE OVER THERMAL BLANKETS. THEY CAN BE MODIFIED WITH CONDUCTIVE YARNS OR FILAMENTS TO CONTROL ELECTROSTATIC CHARGE BUILDUP AT SYNCHRONOUS ORBIT ALTITUDES. TYPICAL CHANGE IN SOLAR ABSORPTANCE (DELTA ALPHA-S) FOR THESE MATERIALS IS LESS THAN 0.01 TO 0.02 AFTER 1000 TO 2000 UVSH WITH NO FURTHER CHANGE OCCURRING FOR LONGER SUN EXPOSURE BASED ON DATA OBTAINED DURING A SIMULATED SPACE ENVIRONMENT TEST. PRELIMINARY DATA FROM A FLIGHT EXPERIMENT CONFIRM THIS PERFORMANCE.

75A24195# ISSUE 9 PAGE 1226 CATEGORY 14 74/00/00 12 PAGES
UNCLASSIFIED DOCUMENT
METHODS FOR SIMULATING THE SPACE EFFECTS ON THERMAL CONTROL COATINGS
A/AKISHIN, A. I.; B/VERNOV, S. N.; C/GUZHOVA, S. K.; D/SOLOVIEV, G. G.; E/TARASOV, IU. I.; F/TITOV, V. I.
IN EVALUATION OF THE EFFECT OF THE SPACE ENVIRONMENT ON MATERIALS; INTERNATIONAL CONFERENCE, TOULOUSE, FRANCE, JUNE 17-21, 1974, PROCEEDINGS. (A75-24160 09-18) PARIS, CENTRE NATIONAL D'ETUDES SPATIALES, 1974, P. 591-598; COMMENTS, P. 599-602.
/*OPTICAL EQUIPMENT/*OPTICAL PROPERTIES/*SOLAR RADIATION SHIELDING/*SPACE ENVIRONMENT SIMULATION/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ CORPUSCULAR RADIATION/ COSMIC RAYS/ EARTH ENVIRONMENT/ ELECTROMAGNETIC RADIATION/ MATERIALS SCIENCE/ SOLAR WIND/ TERRESTRIAL RADIATION/ VACUUM CHAMBERS
ABA V.P.
ABS A FACILITY IS DESCRIBED FOR STUDYING THE BEHAVIOR OF THE OPTICAL PARAMETERS OF THERMAL CONTROL COATINGS UNDER THE EFFECT OF SPACE RADIATIONS EXPERIENCED BY LOW-ORBITING SATELLITES, BY SPACECRAFT PASSING THROUGH THE RADIATION BELTS, AND BY LUNAR AND INTERPLANETARY SPACECRAFT. IN ADDITION, THE FACILITY CAN BE USED TO STUDY THE SUBLIMATION OF MATERIALS AND THE DEGRADATION OF THE TRANSMISSIVITY OF

OPTICAL ELEMENTS BY FILMS FORMING ON THEIR SURFACE. THE TECHNIQUES USED TO SIMULATE SOLAR ELECTROMAGNETIC RADIATION, OXYGEN- AND NITROGEN-ION FLUXES, ATOMIC FLUXES (OF 5 EV KINETIC PARTICLE ENERGY), CORPUSCULAR RADIATIONS, AND THE SOLAR WIND ARE DESCRIBED.

75A24194*# ISSUE 9 PAGE 1366 CATEGORY 74 74/00/00 23 PAGES
UNCLASSIFIED DOCUMENT
CURRENT TECHNOLOGY FOR DEVELOPMENT OF LOW SOLAR ABSORPTANCE/HIGH EMITTANCE COATINGS --- SPACECRAFT THERMAL CONTROL SURFACE MATERIALS
A/GILLIGAN, J. E.; B/HARADA, Y.; C/GATES, D. W. B/(IIT RESEARCH INSTITUTE, CHICAGO, ILL.); C/(NASA, MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.)
IN EVALUATION OF THE EFFECT OF THE SPACE ENVIRONMENT ON MATERIALS; INTERNATIONAL CONFERENCE, TOULOUSE, FRANCE, JUNE 17-21, 1974, PROCEEDINGS. (A75-24160 09-18) PARIS, CENTRE NATIONAL D'ETUDES SPATIALES, 1974, P. 567-589. NASA-SUPPORTED RESEARCH.
/*SOLAR REFLECTORS/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/*ZINC COATINGS/ ABSORPTANCE/ OPTICAL PROPERTIES/ PAINTS/ PIGMENTS/ TITANIUM OXIDES
ABA (AUTHOR)
ABS A COMPREHENSIVE PROGRAM TO DEVELOP LOW SOLAR ABSORPTANCE/HIGH EMITTANCE COATINGS, TO BE SUCCESSFUL, MUST COORDINATE BASIC MATERIALS PREPARATION, COATINGS TECHNOLOGY, ENVIRONMENTAL SIMULATION, PRODUCTION, AND FLIGHT-TEST EVALUATION. THE PRIME CRITERIA FOR 'WHITE' THERMAL-CONTROL COATINGS ARE LOW SOLAR ABSORPTANCE AND, MOST IMPORTANTLY, SOLAR-ABSORPTANCE STABILITY. MANY VARIABLES AFFECT THE SOLAR ABSORPTANCE AND ITS STABILITY. THESE EFFECTS MUST BE DISCERNED AND EVALUATED. THE FACTORS INVOLVED, HOWEVER, ARE NOT ENTIRELY INDEPENDENT; ACCORDINGLY, THE PRESENT PAPER EMPHASIZES THE MAJOR VARIABLES, THE RELATIONSHIPS AMONG THEM, AND HOW IMPORTANT THEY ARE IN IMPROVING THE PROPERTIES AND PERFORMANCE OF THE COATINGS.

75A24187# ISSUE 9 PAGE 1226 CATEGORY 14 74/00/00 21 PAGES IN FRENCH UNCLASSIFIED DOCUMENT
MONOCHROMATIC OR POLYCHROMATIC ULTRAVIOLET IRRADIATION OF VARIOUS MATERIALS
A/PAILLOUS, A.; B/BUISSON, J. P. B/(TOULOUSE, CENTRE D'ETUDES ET DE RECHERCHES, TOULOUSE, FRANCE)
IN EVALUATION OF THE EFFECT OF THE SPACE ENVIRONMENT ON MATERIALS; INTERNATIONAL CONFERENCE, TOULOUSE, FRANCE, JUNE 17-21, 1974, PROCEEDINGS. (A75-24160 09-18) PARIS, CENTRE NATIONAL D'ETUDES SPATIALES, 1974, P. 467-486; COMMENTS, P. 487. IN FRENCH.
/*MATERIALS TESTS/*MONOCHROMATIC RADIATION/*RADIATION EFFECTS/*SOLAR SIMULATORS/*THERMAL CONTROL COATINGS/*ULTRAVIOLET RADIATION/ DESIGN ANALYSIS/ LOW PRESSURE/ LUMINOUS INTENSITY/ MERCURY LAMPS/ REFLECTANCE/ SATELLITE TEMPERATURE/ SOLAR SPECTRA/ SPACE ENVIRONMENT SIMULATION/ SPACECRAFT SHIELDING/ VACUUM TESTS
ABA V.P.
ABS THE DESIGN AND PRINCIPLES OF OPERATION OF A VACUUM FACILITY ARE DESCRIBED, IN WHICH 21 SAMPLES OF THERMAL CONTROL COATINGS CAN BE SUBJECTED SIMULTANEOUSLY TO HIGH-INTENSITY MONOCHROMATIC OR POLYCHROMATIC UV RADIATION FROM HIGH- AND LOW-PRESSURE MERCURY SOURCES.

THE FACILITY PERMITS IN SITU MEASUREMENTS OF TOTAL HEMISPHERIC REFLECTANCE BY ILLUMINATING THE SAMPLE WITH A STABLE LUMINOUS FLUX WHOSE SPECTRAL DISTRIBUTION APPROACHES THAT OF THE SOLAR SPECTRUM, AND MEASURING THE LUMINOUS FLUX EMITTED FROM THE SAMPLE. THE RELATION BETWEEN THE REFLECTED LUMINOUS FLUX AND THE INCIDENT FLUX YIELDS DIRECTLY THE SOLAR TOTAL HEMISPHERIC REFLECTANCE.

75A24185# ISSUE 9 PAGE 1252 CATEGORY 27 74/00/00 10 PAGES IN FRENCH UNCLASSIFIED DOCUMENT

INSPECTION ASSEMBLY FOR DISCRIMINATING BETWEEN PAINT SAMPLES SUBMITTED TO ULTRAVIOLET RADIATION

A/HENNINGER, L.; B/MICHEL, A. B/(CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE, FRANCE)

IN EVALUATION OF THE EFFECT OF THE SPACE ENVIRONMENT ON MATERIALS; INTERNATIONAL CONFERENCE, TOULOUSE, FRANCE, JUNE 17-21, 1974, PROCEEDINGS. (A75-24160 09-18) PARIS, CENTRE NATIONAL D'ETUDES SPATIALES, 1974, P. 441-450. IN FRENCH.

/*HEAT MEASUREMENT/*RADIATION DAMAGE/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/*ULTRAVIOLET RADIATION/ AGING (MATERIALS)/ COATINGS/ MEASURING INSTRUMENTS/ PAINTS/ RADIATION ABSORPTION/ SOLAR SIMULATION/ SOLAR SPECTRA/ TEMPERATURE MEASUREMENT/ VACUUM CHAMBERS

ABA S.J.M.

ABS A HEAT-SENSING METHOD IS DESCRIBED WHICH ALLOWS ELIMINATING PAINT SAMPLES THAT ARE AGING TOO RAPIDLY UNDER UV LIGHT. THE SETUP PERMITS THE SIMULTANEOUS IRRADIATION OF 8 SAMPLES PLACED IN SEPARATE VACUUM CHAMBERS, IN SUCH A WAY THAT ONE CHAMBER CAN BE OPENED WITHOUT DISTURBING THE OTHERS. A NUMBER OF QUANTITATIVE RESULTS ARE PRESENTED WHICH DEMONSTRATE THE EFFECTIVENESS OF THE METHOD. A BRIEF REVIEW OF PERTINENT THERMOOPTICAL PRINCIPLES IS ALSO PROVIDED.

74A39131*# ISSUE 19 PAGE 2773 CATEGORY 31 ASME PAPER 74-ENAS-32 74/07/00 9 PAGES UNCLASSIFIED DOCUMENT

THERMAL DESIGN OF THE IMP-I AND H SPACECRAFT

A/HOFFMAN, R. H. A/(NASA, GODDARD SPACE FLIGHT CENTER, THERMOPHYSICS BRANCH, GREENBELT, MD.) MEMBERS, $1.00; NONMEMBERS, $3.00

SAE, AIAA, ASME, ASMA, AND AICHE, INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SEATTLE, WASH., JULY 29-AUG. 1, 1974, ASME 9 P.

/*EXPLORER SATELLITES/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/*THERMAL INSULATION/ COMPUTERIZED SIMULATION/ METAL COATINGS/ SILVER/ TEFLON (TRADEMARK)/ TEMPERATURE CONTROL

ABA (AUTHOR)

ABS A DESCRIPTION OF THE THERMAL SUBSYSTEM OF THE IMP-I AND H SPACECRAFT IS PRESENTED. THESE TWO SPACECRAFT WERE OF A LARGER AND MORE ADVANCED TYPE IN THE EXPLORER SERIES AND WERE SUCCESSFULLY LAUNCHED IN MARCH 1971 AND SEPTEMBER 1972. THE THERMAL REQUIREMENTS, ANALYSIS, AND DESIGN OF EACH SPACECRAFT ARE DESCRIBED INCLUDING SEVERAL SPECIFIC DESIGNS FOR INDIVIDUAL EXPERIMENTS. TECHNIQUES FOR OBTAINING VARYING DEGREES OF THERMAL ISOLATION AND CONTACT ARE PRESENTED. THE THERMAL CONTROL COATINGS INCLUDING THE SPACEFLIGHT PERFORMANCE OF SILVER-COATED FEP TEFLON ARE DISCUSSED. PREDICTED PERFORMANCE IS COMPARED TO MEASURED FLIGHT DATA. THE GOOD AGREEMENT BETWEEN THEM VERIFIES THE

VALIDITY OF THE THERMAL MODEL AND THE SELECTION OF COATINGS.

74A22653# ISSUE 9 PAGE 1275 CATEGORY 29 73/09/00 32 PAGES
UNCLASSIFIED DOCUMENT
METHODOLOGY CONCERNING THE SIMULATION OF IONIZING RADIATIONS WITH SPECIAL REFERENCE TO COATINGS WHEN IN GEOSTATIONARY ORBIT
A/BOURRIEAU, J.; B/PAILLOUS, A.; C/PHILIPPON, J.-P.; D/GIACOMONI, J.-C.; E/ZILIANI, A. C/(ONERA, CENTRE D'ETUDES ET DE RECHERCHES DE TOULOUSE, TOULOUSE, FRANCE); E/(SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, CANNES, FRANCE)
ONERA AND INSTITUT DE RECHERCHE D'INFORMATIQUE ET D'AUTOMATIQUE, INTERNATIONAL SEMINAR ON SIMULATION AND SPACE, ECOLE NATIONALE SUPERIEURE DE L'AERONAUTIQUE ET DE L'ESPACE, TOULOUSE, FRANCE, SEPT. 10-14, 1973, PAPER. 32 P.
/*IONIZING RADIATION/*SPACE ENVIRONMENT SIMULATION/*SPACECRAFT SHIELDING/*STATIONARY ORBITS/*THERMAL CONTROL COATINGS/ ELECTRON ENERGY/ PROTON ENERGY/ RADIATION DOSAGE
ABA (AUTHOR)
ABS A DESCRIPTION IS GIVEN OF THE METHOD USED TO EVALUATE THE BEHAVIOR OF THERMAL CONTROL COATINGS WHEN IN GEOSTATIONARY ORBIT. THE MATHEMATICAL PRINCIPLES OF PARTICLE COMPUTATION ARE DESCRIBED, AS WELL AS THOSE USED WHEN CALCULATING THE DOSES OF ENERGY ABSORBED IN THE MATERIALS. THE EFFECTS OF THE VARIOUS PROTON AND ELECTRON ENERGY BANDS ARE DISCUSSED. FROM THIS, PARTICLE ENERGIES AND FLUXES ARE DEDUCED TO BE USED IN THE SIMULATION OF THE ENVIRONMENT IN SPACE.

73A37969# ISSUE 19 PAGE 2389 CATEGORY 3 ASME PAPER 73-ENAS-7
73/07/00 4 PAGES UNCLASSIFIED DOCUMENT
THERMAL CONTROL MATERIALS AND TECHNOLOGY IN THE 1970'S.
(SPACECRAFT THERMAL CONTROL COATINGS DEVELOPMENT, DISCUSSING ZINC ORTHOTITANATE/SILICONE PROPERTIES AS SOLAR REFLECTOR)
A/GILLIGAN, J. E.; B/ZERLAUT, G. A. B/(IIT RESEARCH INSTITUTE, CHICAGO, ILL.) MEMBERS, $1.00; NONMEMBERS, $3.00
SAE, ASME, AIAA, ASMA, AND AICHE, INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN DIEGO, CALIF., JULY 16-19, 1973, ASME 4 P.
/*SILICONES/*SPACECRAFT SHIELDING/*TEMPERATURE CONTROL/*THERMAL CONTROL COATINGS/*TITANATES/*ZINC COMPOUNDS/ ELECTROCONDUCTIVITY/ ENERGY CONVERSION/ PAINTS/ PIGMENTS/ PROTECTIVE COATINGS/ SOLAR ENERGY ABSORBERS/ SOLAR REFLECTORS/ TECHNOLOGY TRANSFER
ABA (AUTHOR)
ABS RECENT ACTIVITIES IN THE RESEARCH AND DEVELOPMENT OF STABLE SPACECRAFT THERMAL CONTROLS MATERIALS AND SYSTEMS ARE REVIEWED, AND PROJECTIONS ARE MADE FOR THE EXPECTED ACHIEVEMENTS IN THIS AND OTHER FIELDS. IN ADDITION TO THE NEED TO SOLVE A SYNERGISTIC REACTION BETWEEN ZINC ORTHOTITANATE AND CERTAIN SILOXANE VEHICLES, AN ADDITIONAL REQUIREMENT - THAT SUCH SYSTEMS BE NONCONTAMINATING AND NONCONTAMINABLE - HAS ADDED AN IMPORTANT, AND DIFFICULT DIMENSION TO THE DEVELOPMENT OF THESE COATINGS/SURFACES. IN THE PAPER THE R & D OF AN ULTRASTABLE, LOW ALPHA SUB S/EPSILON PAINT CONSISTING OF ZINC ORTHOTITANATE AND A MODIFIED COMMERCIAL SILICONE IS DESCRIBED. SOME OF THE APPLICATIONS AND MATERIALS REQUIREMENTS FOR SOLAR ENERGY UTILIZATION ARE DISCUSSED. THE SPECIAL REQUIREMENTS OF ELECTROCONDUCTIVE SURFACES FOR REPRODUCTION

AND OTHER USES ARE ALSO BRIEFLY REVIEWED IN LIGHT OF APPLICABLE SPACE THERMOPHYSICS TECHNOLOGY.

73A13009 ISSUE 3 PAGE 329 CATEGORY 18 72/00/00 12 PAGES
UNCLASSIFIED DOCUMENT
MATERIALS AND PROCESSES FOR THERMAL CONTROL SURFACES.
A/KORDSMEIER, N. H., JR.; B/PETERS, S. T. A/(LOCKHEED MISSILES AND SPACE, INC., SUNNYVALE, CALIF.); B/(TEXTRON, INC., DALMO VICTOR, BELMONT, CALIF.)
IN NON-METALLIC MATERIALS SELECTION, PROCESSING AND ENVIRONMENTAL BEHAVIOR; PROCEEDINGS OF THE FOURTH NATIONAL TECHNICAL CONFERENCE AND EXHIBITION, PALO ALTO, CALIF., OCTOBER 17-19, 1972. (A73-13001 03-18) AZUSA, CALIF., SOCIETY OF AEROSPACE MATERIAL AND PROCESS ENGINEERS, 1972, P. 79-90.
/*SPACECRAFT CONSTRUCTION MATERIALS/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ HEAT SHIELDING/ MATERIALS SCIENCE/ OPTICAL PROPERTIES/ OUTGASSING/ PAINTS/ PROTECTIVE COATINGS/ SOLAR REFLECTORS/ SPACE MAINTENANCE/ SPACECRAFT ENVIRONMENTS/ TECHNOLOGY ASSESSMENT/ THERMAL RESISTANCE
ABA (AUTHOR)
ABS SEVERAL SPACECRAFT THERMAL-CONTROL MATERIALS AND FINISHES ARE DISCUSSED IN TERMS OF APPLICATION PARAMETERS, PROCESSING DIFFICULTIES, AND THERMO-OPTICAL PROPERTIES. REPAIR TECHNIQUES AND PROTECTIVE MEASURES SUITABLE FOR RETENTION OF REQUISITE THERMO-OPTICAL PROPERTIES ARE SUGGESTED. MATERIALS AND FINISHING SYSTEMS CONSIDERED INCLUDE PAINTS, TAPES AND FILMS, SECOND-SURFACE MIRRORS, ANODIZED COATINGS, PLATINGS, UNTREATED METALS, AND VAPOR-DEPOSITED COATINGS.

72A31806* ISSUE 15 PAGE 2260 CATEGORY 18 NAS8-5379 NAS8-21074
JPL-951746 72/00/00 40 PAGES UNCLASSIFIED DOCUMENT
RECENT ADVANCES IN SPACECRAFT THERMAL-CONTROL MATERIALS RESEARCH.
(SPACECRAFT THERMAL CONTROL MATERIALS RESEARCH, DISCUSSING SURFACE SELECTION, COATINGS, SPACE SIMULATION AND ENVIRONMENTAL EFFECTS)
A/ZERLAUT, G. A.; B/GILLIGAN, J. E.; C/GATES, D. W. B/(IIT RESEARCH INSTITUTE, CHICAGO, ILL.); C/(NASA, MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.)
IN INTERNATIONAL ASTRONAUTICAL CONGRESS, 20TH, MAR DEL PLATA, ARGENTINA, OCTOBER 5-10, 1969, PROCEEDINGS. (A72-31801 15-31) OXFORD, PERGAMON PRESS, LTD.; WARSAW, PANSTWOWE WYDAWNICTWO NAUKOWE, 1972, P. 91-130.
/*SPACE ENVIRONMENT SIMULATION/*SPACECRAFT SHIELDING/*SURFACE PROPERTIES/*THERMAL CONTROL COATINGS/ CONFERENCES/ METAL COATINGS/ PAINTS/ PIGMENTS/ TECHNOLOGIES
ABA G.R.
ABS THE STATE-OF-THE-ART OF SPACECRAFT THERMAL-CONTROL MATERIALS TECHNOLOGY HAS BEEN SIGNIFICANTLY ADVANCED DURING THE PAST 4 YEARS. SELECTIVE BLACK COATINGS ARE DISCUSSED TOGETHER WITH BLACK PAINTS, DIELECTRIC FILMS ON METAL SURFACES, AND WHITE RADIATOR COATINGS. CRITERIA FOR THE SELECTION OF THERMAL-CONTROL SURFACES ARE CONSIDERED, GIVING ATTENTION TO PRELAUNCH PROTECTION, THE CAPABILITY OF BEING MEASURED, REPRODUCIBILITY, SIMULATOR RESPONSE, AND ASPECTS OF A NONINDIGENOUS SPACE ENVIRONMENT. PROGRESS IN SPACE SIMULATION IS

RELATED TO VACUUM TECHNOLOGY, ULTRAVIOLET SOURCES, SOLAR WIND SIMULATICN, AND THE PRODUCTION OF PROTONS. ADVANCES HAVE BEEN MADE IN THE PROTECTION AGAINST SPACE ENVIRONMENTAL EFFECTS, AND IN THE DEVELOPMENT OF THERMAL-CONTROL SURFACES AND PIGMENTS.

72A26183*# ISSUE 11 PAGE 1746 CATEGORY 33 AIAA PAPER 72-445
72/04/00 11 PAGES UNCLASSIFIED DOCUMENT
DAMAGE OF THERMAL CONTROL COATING PROPERTIES BY ENERGETIC MERCURY ION BOMBARDMENT.
(SPACECRAFT THERMAL CONTROL COATING DAMAGE BY ENERGETIC HG ION BOMBARDMENT, USING ABSORPTANCE MEASUREMENTS)
A/KELLEY, L. R.; B/LUEDKE, E. E.; C/HALL, D. F. C/(TRW SYSTEMS GROUP, REDONDO BEACH, CALIF.) MEMBERS, $1.50; NONMEMBERS, $2.00
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, ELECTRIC PROPULSION CONFERENCE, 9TH, BETHESDA, MD., APR. 17-19, 1972, 11 P. NASA-SUPPORTED RESEARCH.
/*ION IRRADIATION/*MERCURY (METAL)/*METAL IONS/*RADIATION DAMAGE/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ ABSORPTANCE/ CONFERENCES/ PARTICLE ENERGY/ SPECTRUM ANALYSIS
ABA (AUTHOR)
ABS THE THERMOPHYSICAL PROPERTIES (ABSORPTANCE AND EMITTANCE) OF FIVE COMMONLY USED SPACECRAFT THERMAL CONTROL COATINGS HAVE BEEN MEASURED IN SITU AFTER EXPOSURE TO 1.5 AND 3 KEV MERCURY IONS. SAMPLE TEMPERATURE WAS VARIED FRCM 20 TC 150 C. THE RESULTS SHOWED NEGLIGIBLE CHANGE IN EMITTANCE BUT SIGNIFICANT DEGRADATION OF THE SOLAR ABSORPTANCE AT FLUENCES OF 10 TO THE 17TH POWER IONS/SQ CM. PLOTS OF ABSORPTANCE AS A FUNCTION OF ION FLUENCE ARE PRESENTED, ALONG WITH PRE- AND POST-EXPOSURE EX SITU SPECTRAL ABSORPTANCE MEASUREMENTS. THE WIDELY USED Z93 WHITE PAINT EXHIBITED QUANTITATIVE DEGRADATION FRCM MERCURY IONS SIMILAR TO THAT REPORTED BY OTHER EXPERIMENTERS FOR HYDROGEN AND HELIUM IONS.

77N71051 67/00/00 13 PAGES UNCLASSIFIED DOCUMENT
IRIDIUM COATINGS COATINGS FOR THE PROTECTION OF GRAPHITE RE-ENTRY STRUCTURES
A/WRIGHT, T. R.; B/WEYAND, J. D.; C/RIZER, D. E.; D/SIMMONS, W. C.
BATTELLE COLUMBUS LABS., OHIO.; AIR FORCE MATERIALS LAB., WRIGHT-PATTERSON AFB, OHIO. AVAIL.NTIS
IN CANAVERAL COUNCIL OF TECH. SOCS. PROC. OF THE 4TH SPACE CONGR., PT. 2 13 P (SEE N77-71035 03-98) PREPARED IN COOPERATION WITH THE AIR FORCE MATERIALS LAB., WRIGHT-PATTERSON AFB, OHIO
/*GRAPHITE/*IRIDIUM/*REENTRY SHIELDING/ SPACECRAFT SHIELDING/ THERMAL CONTROL COATINGS

75N77063* NASA-CR-133195 IITRI-C6233-28 NAS8-26791 73/06/12 27 PAGES UNCLASSIFIED DOCUMENT
DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS FOR USE ON LARGE SPACE VEHICLES TRIANNUAL REPORT, 1 JAN. - 30 APR. 1973
A/GILLIGAN, J. E.; B/HARADA, Y.
IIT RESEARCH INST., CHICAGO, ILL. (TECHNOLOGY CENTER.)

AVAIL.NTIS
/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ HEAT SHIELDING/ PIGMENTS

76N31032 ISSUE 21 PAGE 2799 CATEGORY 76 76/00/00 381 PAGES UNCLASSIFIED DOCUMENT

EMITTANCE OF THIN METALLIC FILMS AT CRYOGENIC TEMPERATURES --- THERMAL RADIATION PROPERTIES OF THERMAL CONTROL COATINGS OF SPACECRAFT SHIELDING PH.D. THESIS

A/FORSBERG, C. H.

COLUMBIA UNIV., NEW YORK. AVAIL UNIV. MICROFILMS ORDER NO. 76-18466

/*CRYOGENICS/*EMITTANCE/*METAL FILMS/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/*THERMAL RADIATION/*THIN FILMS/ ABSORPTANCE/ ALUMINUM/ DIFFERENTIAL EQUATIONS/ INSULATED STRUCTURES/ NUMERICAL ANALYSIS/ REFLECTANCE

ABA DISSERT. ABSTR.

ABS THE THERMAL RADIATION PROPERTIES (I.E., EMITTANCE OF ABSORPTANCE, REFLECTANCE, AND TRANSMITTANCE) OF THIN METALLIC FILMS AND METAL-COATED DIELECTRIC FILMS AT CRYOGENIC TEMPERATURES WAS INVESTIGATED. KNOWLEDGE OF SUCH PROPERTIES IS OF MAJOR IMPORTANCE DUE TO USE OF THESE FILMS IN A VARIETY OF APPLICATIONS, INCLUDING MULTILAYER INSULATIONS AND SPACECRAFT THERMAL CONTROL SURFACES. BOTH THEORETICAL AND EXPERIMENTAL DETERMINATIONS OF THE THERMAL RADIATION PROPERTIES OF THESE FILMS ARE CONSIDERED. IN THE THEORETICAL PORTION OF THE WORK, THE PROPERTIES OF A SINGLE METALLIC FILM WERE OBTAINED THROUGH THE NUMERICAL SOLUTION OF THE GOVERNING INTEGRODIFFERENTIAL EQUATION FOR THE ANOMALOUS SKIN EFFECT THEORY WITH SIZE EFFECTS INCLUDED. THE EXPERIMENTAL PORTION OF THE WORK DEALT WITH THE DESIGN AND CONSTRUCTION OF AN EXPERIMENTAL APPARATUS USED TO DETERMINE THE RADIATION EMITTED BY AN ALUMINUM FILM FROM COMMERCIALLY-AVAILABLE MULTILAYER INSULATION. THE RESULTS OF THE EXPERIMENTAL INVESTIGATION ARE PRESENTED AND COMPARED WITH THE RESULTS OBTAINED BY OTHER RESEARCHERS.

75N26139*# ISSUE 17 PAGE 2093 CATEGORY 27 NASA-CR-143879 IITRI-C6233-52 NAS8-26791 75/06/00 34 PAGES UNCLASSIFIED DOCUMENT

DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS FOR USE ON LARGE SPACE VEHICLES TRIANNUAL REPORT, 1 JAN. - 30 APR. 1975

A/HARADA, Y.; B/GILLIGAN, J. E.

IIT RESEARCH INST., CHICAGO, ILL. (TECHNOLOGY CENTER.)

AVAIL.NTIS HC $3.75

/*HEAT SHIELDING/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/ ENVIRONMENT EFFECTS/ OXALATES/ PIGMENTS/ SOLAR REFLECTORS/ TITANIUM COMPOUNDS/ ZINC COMPOUNDS

ABA AUTHOR

ABS PIGMENT MANUFACTURING DEVELOPMENT, BINDER DEVELOPMENT, ENVIRONMENTAL EFFECTS EVALUATIONS, AND GENERAL COATINGS INVESTIGATIONS ARE DISCUSSED. THE RELATIVE EMPHASIS ON EACH OF THESE TASKS VARIED ACCORDING TO THE URGENCY OF THE PROBLEMS ELUCIDATED AND THE AVAILABILITY OF TIME AND FUNDS. EMPHASIS IS PLACED ON THE DEVELOPMENT

OF A MIXED OXALATE PRECURSOR ZINC CRTHOTITANATE PIGMENT MANUFACTURING METHOD AND RELATED STUDIES AND CN COMPLEMENTARY ENVIRONMENTAL TESTING AND EVALUATION ACTIVITIES.

75N20452*# ISSUE 12 PAGE 1356 CATEGORY 18 NASA-CR-120723
IITRI-C6233-40 NAS8-26791 74/08/00 38 PAGES UNCLASSIFIED
DOCUMENT

DEVELOPMENT OF SPACE STABLE THERMAL CCNTRCL COATINGS FCR USE ON LARGE SPACE VEHICLES --- EFFECTS OF ULTRAVIOLET RADIATION TRIANNUAL REPORT, 1 JAN. - 31 APR. 1974

A/GILLIGAN, J. E.; B/HARADA, Y.

IIT RESEARCH INST., CHICAGO, ILL. AVAIL.NTIS HC $3.75

/*PROTECTIVE COATINGS/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/*ULTRAVIOLET RADIATION/ PERFORMANCE TESTS/ PIGMENTS/ REFLECTANCE/ STABILITY TESTS/ TEMPERATURE EFFECTS/ ZINC COATINGS

ABA AUTHOR

ABS THE DEVELOPMENT OF A LARGE SCALE MANUFACTURING METHOD FOR THE PRODUCTICN OF A STABLE ZINC ORTHOTITANATE PIGMENT IS DISCUSSED. MAJOR EMPHASIS WAS PLACED ON THE EVALUATION OF THE RADIATION STABILITY OF TEKTRONIX, INC. PIGMENTS AND OF THE CONDITIONS (TIME AND TEMPERATURE) LEADING TO HIGH REFLECTION ANC HIGH OPTICAL STABILITY. PAINTS WERE FORMULATED IN OI-650 AND IN OI-650G VEHICLES FROM PIGMENTS WHICH WERE PREPARED AT VARIOUS TEMPERATURES, SOME OF WHICH WERE CHEMICALLY TREATED TO REMOVE ZNO. ULTRAVIOLET IRRACIATION TESTS OF THESE PAINTS WERE PERFORMED, AND OBSERVATIONS MADE REGARDING OPTIMUM PIGMENT PREPARATION PARAMETERS.

75N20451*# ISSUE 12 PAGE 1356 CATEGORY 18 NASA-CR-120722
IITRI-C6233-44 NAS8-26791 74/10/00 112 PAGES UNCLASSIFIED
DOCUMENT

DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS FOR USE ON LARGE SPACE VEHICLES --- EFFECTS OF ULTRAVIOLET RADIATION TRIANNUAL REPORT, 1 MAY - 31 AUG. 1974

A/GILLIGAN, J. E.; B/HARADA, Y.

IIT RESEARCH INST., CHICAGO, ILL. (TECHNOLOGY CENTER.) AVAIL.NTIS HC $5.25

/*PROTECTIVE COATINGS/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/*ULTRAVIOLET RADIATICN/ OXALATES/ PERFORMANCE TESTS/ PIGMENTS/ REFLECTANCE/ STABILITY TESTS/ ZINC COATINGS

ABA AUTHOR

ABS THE DEVELOPMENT OF A LARGE SCALE MANUFACTURING METHOD FOR THE PRODUCTICN OF A STABLE ZINC ORTHOTITANATE PIGMENT IS DISCUSSED. MAJOR EMPHASIS WAS PLACED ON THE EVALUATICN OF ULTRAVIOLET RADIATION STABILITY TESTS OF PIGMENTS DERIVED FROM COPRECIPITATED AND INDIVIDUALLY PRECIPITATED OXALATES. EMPHASIS WAS ALSO PLACED ON AN INVESTIGATION OF THE CONDITIONS (TIME AND TEMPERATURE) LEADING TO HIGH REFLECTANCE AND HIGH OPTICAL STABILITY. PAINTS WERE FORMULATED IN OI-650 AND IN OI-650G VEHICLES FROM PIGMENTS WHICH WERE PREPARED AT VARIOUS TEMPERATURES. ANALYSES OF ULTRAVIOLET IRRADIATION TEST DATA WERE CONDUCTED REGARDING OPTIMUM PIGMENT PREPARATION PARAMETERS AND TREATMENT CONDITIONS.

73N18144*#   ISSUE 9   PAGE 998   CATEGORY 6   NASA-CR-124067
NAS8-21317   72/05/00   188 PAGES   UNCLASSIFIED DOCUMENT

PREPARATION OF PIGMENTS FOR SPACE-STABLE THERMAL CONTROL COATINGS
(PIGMENTS FOR SPACE-STABLE THERMAL CONTROL COATINGS TO SHIELD SPACECRAFT FROM SOLAR RADIATION)   FINAL REPORT, 1 JUN. 1968 - 31 MAR. 1972

A/CAMPBELL, W. B.; B/SMITH, R. G.
OHIO STATE UNIV. RESEARCH FOUNDATION, COLUMBUS.
AVAIL.NTIS   HC $11.50
/*PIGMENTS/*SOLAR RADIATION SHIELDING/*SPACECRAFT SHIELDING/*STABILITY/*THERMAL CONTROL COATINGS/*VAPOR PHASES/ ALUMINUM OXIDES/ CALCIUM TUNGSTATES/ NUCLEATION/ REACTION KINETICS/ ZINC COMPOUNDS
ABA AUTHOR

ABS THE IDENTIFICATION AND CONTROL OF VAPOR PHASE REACTION KINETICS TO PRODUCE PIGMENTS BY HOMOGENEOUS NUCLEATION WERE ACHIEVED. A VAPOR PHASE APPARATUS WAS DESIGNED, FABRICATED, AND CALIBRATED THROUGH 1800 C. VAPOR PHASE REACTIONS WERE ANALYZED, CALCULATIONS MADE, AND POWDERS OF ALUMINA, RUTILE, ZINC ORTHOTITANATE (IN A MIXED PHASE), CALCIUM TUNGSTATE, AND LANTHANA WERE PRODUCED BY HOMOGENEOUS NUCLEATION. ELECTRON MICROSCOPY SHOWS UNIFORM PARTICLE MORPHOLOGY AND SIZE, AND SUPPORTS ANTICIPATED ADVANTAGES OF VAPOR-PHASE HOMOGENEOUS NUCLEATION; NAMELY, PURITY, FREEDOM FROM DEFECTS, AND UNIFORM PARTICLE SIZING WITHOUT GRINDING.

72N18576*#   ISSUE 9   PAGE 1222   CATEGORY 18   NASA-CR-123531
IITRI-U6002-97   NAS8-5379 IITRI PROJ. U6002   71/10/08   377 PAGES   UNCLASSIFIED DOCUMENT

INVESTIGATION OF ENVIRONMENTAL EFFECTS ON COATINGS FOR THERMAL CONTROL OF LARGE SPACE VEHICLES
(EVALUATION OF WHITE PIGMENTED COATINGS FOR THERMAL CONTROL OF SPACECRAFT)   FINAL REPORT, 20 MAY 1963 - 8 OCT. 1971

A/ZERLAUNT, G. A.; B/GILLIGAN, J. E.; C/ASHFORD, N. A.
IIT RESEARCH INST., CHICAGO, ILL.   AVAIL.NTIS
/*SPACECRAFT SHIELDING/*SPRAYED COATINGS/*THERMAL CONTROL COATINGS/ ORGANIC SILICON COMPOUNDS/ PAINTS/ PIGMENTS/ RADIATION PROTECTION/ TITANATES/ ZINC COMPOUNDS
ABA AUTHOR

ABS THE OBJECTIVE OF SIGNIFICANTLY ADVANCING THE STATE-OF-THE-ART OF WHITE, SPACECRAFT-RADIATOR COATINGS HAS BEEN REALIZED IN A COMPREHENSIVE GOAL-ORIENTED, PIGMENTED-COATINGS RESEARCH PROGRAM. CONSIDERED WERE INORGANIC PIGMENTS AND COATINGS, SILICONE POLYMERS AND COATINGS, THE DESIGN AND CONSTRUCTION OF A COMBINED ULTRAVIOLET-PLUS-PROTON IRRADIATION FACILITY, THE DEVELOPMENT OF ZINC ORTHOTITANATE PIGMENT AND COATINGS, AND THE EFFECTS ON SEVERAL LOW ALPHA SUB S/EPSILON PAINTS OF COMBINED ULTRAVIOLET AND PROTON IRRADIATION.

71N26772*   ISSUE 14   PAGF 2281   CATEGORY 18   NASA-CASE-XMF-07770-2
US-PATENT-3,576,656 US-PATENT-APPL-SN-711903 US-PATENT-CLASS-106-296
71/04/27 4 PAGES   UNCLASSIFIED DOCUMENT
STABILIZED ZINC OXIDE COATING COMPOSITICNS PATENT
(BINDER STABILIZED ZINC OXIDE PIGMENTED COATING FOR SPACECRAFT THERMAL CONTROL)
A/CARROLL, W. F.; B/GATES, D. W.; C/ZERLAUT, G. A.   (ACINVENTOR /TO NASA/ ABINVENTOR /TO NASA/ AAINVENTOR /TO NASA/)
IIT RESEARCH INST., CHICAGO, ILL.   AVAIL.NTIS
AVAIL- US PATENT OFFICE
CL. 106-296, INT. CL. C09C1/04 CONTINUATION-IN-PART OF US PATENT APPL. SN-644449, FILED 2 JUN. 1967
/*PIGMENTS/*SPACECRAFT SHIELDING/*THERMAL CONTROL COATINGS/*ZINC OXIDES/ BINDERS (MATERIALS)/ PATENTS/ PROTECTIVE COATINGS/ ZINC COATINGS

71N16500*#   ISSUE 6   PAGE 881   CATEGORY 18   NASA-TM-X-2155 E-5859
704-00   71/02/00 34 PAGES   UNCLASSIFIED DOCUMENT
APPLICATION OF SERT 2 THERMAL CONTROL COATINGS
(TECHNIQUES FOR APPLYING THERMAL CONTROL COATINGS TO SERT 2 SPACECRAFT)
A/STEVENS, N. J.
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.
WASHINGTON
/*SERT 2 SPACECRAFT/*SPACECRAFT STRUCTURES/*THERMAL CONTROL COATINGS/ METAL SURFACES/ PROTECTIVE COATINGS/ SPACECRAFT SHIELDING

DIALOG SEARCH

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1	0	CMAAG/NASA CONTRACT
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7	97	6-2

Print 7/5/1-97

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System Support Studies under Production Support Program. Volume 2. Part 1

Aerojet-General Corp Sacramento Calif (007 200)

Final rept. 18 Aug 64-31 Sep 65
Childres, H. E.
D2635D1 Fld: 21H d7715
31 Sep 65 145p
Rept No: 0162-06TDR-9-Vol-2-Pt-1
Contract: AF 04(694)-308
Task: 41-011 , 41-014
Monitor: 18
See also volume 2, part 2, AD-479 205 and volume 1, AD-479 202.
Distribution limitation now removed.

Abstract: Contents: Study of TVC System Pressurization Methods; Nozzle-Motor Configuration Optimization; Motor Development, Layout, and Analysis; Bladder Improvement Study; LITVC Manifold and Joint Design Study; Investigation of Exit Cone Material Behavior; Igniter Initiator Materials-and-Performance Evaluation; Characterization of Pyrotechnic Ignition Properties; Evaluation of Alternative Insulation Materials; Roll-Control Valve Transducer Testing.

Descriptors: (*Second-stage motors, *Rocket nozzles), Thrust vector control systems, Performance(Engineering), Reliability, Weight, Costs, Nozzle gas flow, Nozzle inserts, Nozzle throats , Nozzle closures, Graphite, Guided missile components, Thermal insulation, Surface to surface missiles, Secondary injection, Solid propellant rocket engines, Design

Identifiers: Minuteman, NTISDODXD

AD-479 227/1ST NTIS Prices: PC$6.00/MF$3.00

System Support Studies under Production Support Program. Volume 2 Part 2

Aerojet-General Corp Sacramento Calif (007 200)

Final rept. 18 Aug 64-31 Sep 65
Childres, Harold E.
D2635B4 Fld: 21H, 16D d7715
15 Feb 66 185p
Rept No: 0162-06TDR-9-Vol-2-Pt-2
Contract: AF 04(694)-308
Task: 41-011 , 41-014
Monitor: 18
See also Volume 1, AD-479 202 and Volume 2 Supplement 1, AD-370 624.
Distribution limitation now removed.

Abstract: Studies were made in support of production programs for Wing VI Minuteman second-stage motors. Summaries follow for the nine areas of program effort discussed. (1) Studies were made of various injectant-type TVC systems that could be considered feasible for application with the current second stage and other solid-propellant motors. (2) Toward deriving range increase, investigations were made to increase motor propellant loading and to reduce the weight to inert components. (3) Studies were made of the physical and mechanical properties of LITVC bladder materials; included were Viton A-HV with Dacron, with Nomex HT 2-41, and with Dacron and a nylon barrier. (4) Program studies were directed toward development of leak-proof LITVC joints and replacement of joints through welding. (5) Laboratory performance tests were made of exit cone materials (graphite- and silica-phenolic tapes) and to determine the behavior of these materials and interface bonds when considering effect of material and processing variables. (6) A series of igniter assemblies were tested to determine the adequacy of an igniter initiator having an unbonded, solid polyurethane-foam spacer in place of the bonded, perforated spacer. (7) Ignition properties were characterized for advanced propellants and blends and pelleted pyrotechnics. (8) Evaluations were made of new elastomeric compounds including ethylene propylene terpolymers and butyl acrylics. (9) An intensive study was conducted to resolve discrepancies between inspection data for roll-control valves and position-transducers. (Author)

Descriptors: (*Second-stage motors, *Surface to surface missiles), Performance(Engineering), Secondary injection, Thrust vector control systems, Injection, Solid propellant rocket engines, Glass textiles, Dacron, Tape wound construction, Loading, Weight, Thermal insulation, Composite materials, Roll, Solid rocket propellants, Rocket igniters, Elastomers, Stresses, Thermal analysis, O rings, Test methods, Optimization, Ignition, Rocket engine cases, Joints, Rocket nozzles

Identifiers: Litvc(Liquid injection thrust vector control), Minuteman, Nomex, Submerged nozzles, Viton fluoroelastomers, NTISDODXD

AD-479 205/7ST NTIS Prices: PC$7.50/MF$3.00

System Support Studies under Production Support Program

Aerojet-General Corp Sacramento Calif (007 200)

Final rept. 18 Aug 64-31 Sep 65
Childres , Harold E., Mastrolia, Edmund J.
D2635B3 Fld: 21H, 13H d7715
15 Feb 66 294p
Rept No: 0162-06TDR-9-Vol-1
Contract: AF 04(694)-308
Task: 41-001 , 41-002
Monitor: 18
Distribution limitation now removed.

Abstract: Studies were made in support of production programs for Wing VI Minuteman second-stage motors. Summaries follow for the five areas of program effort discussed in this volume of the final report. (1) Statistical analyses were made of various materials and components with respect to manufacturing and performance reproducibility. Major effort was directed toward investigation of internal insulation, LITVC and RC systems and nozzles. (2) Detailed investigations were made to resolve and preclude problems concerning production and performance of the CTPB propellant and liner system. Studies included: determination of the storage stability of propellant, liner, and raw materials; bonding characteristics of the liner system; demonstration of the adequacy of SD-844-1 adhesive; and evaluation of production-propellant properties. Investigations were made of problems concerning propellant modulus, igniter delays and decomposition of igniter seals. (3) A series of analyses was directed toward solution of problems concerning igniter delay, LITVC pressure transducers, and exit cones. (4) Toward improving the reliability of LITVC and RC gas generators, detailed investigations were made of proprietary data obtained from the vendor. (5) Studies were made of the packaging design of the present TVC system and of other TVC systems. (Author)

Descriptors: (*Second-stage motors, *Solid propellant rocket engines), Surface to surface missiles, Manufacturing, Statistical analysis, Quality control, Thermal insulation, Thrust vector control systems, Combustion chamber liners, Storable rocket propellants, Stability, Bonding, Adhesives, Igniters, Pressure, Transducers, Exhaust nozzles, Graphite, Phenolic plastics, Silicon compounds, Dioxides, Gas generating systems, Attitude control systems, Roll, Solid rocket propellant binders, Carboxylic acids, Polymers, Nitrogen heterocyclic compounds, Butadienes, Secondary injection

Identifiers: Bita, Minuteman, Polybutadiene/carboxy terminated , NTISDODXD

AD-479 202/4ST NTIS Prices: PC$9.25/MF$3.00

Lifting Re-Entry Vehicle Nose Cap Materials Survey: Arc-Tunnel Test Results

Aerospace Corp El Segundo Calif Lab Operations (009 575)

Technical documentary rept.
Welsh, William E. Jr
D2473J1 Fld: 22B, 11B d7714
Dec 65 33p
Rept No: TDR-669(6240-10)-2
Contract: AF 04(695)-669
Monitor: SSD-TR-66-45
Distribution limitation now removed.

Abstract: Lifting re-entry vehicles in the lower range of sizes currently envisioned require the application of relatively high density ablation materials in the nose and flap regions to limit the shape change due to surface recession. Tests were conducted on 22 available high density ablation materials in a plasma-arc tunnel to evaluate thermal response, surface recession, and mechanical characteristics. Three heat flux levels were imposed: 40, 100, and 140 Btu/sq ft sec. Parallel-laminate materials were found to form serious delaminations and cracks, whereas 20-deg laminates and random-fabric materials survived the tests without mechanical failures. Surface recession rates and thermal response results are reported. (Author)

Descriptors: (*Reentry vehicles, *Refractory materials), Heat shields, Phenolic plastics, Carbon, Laminates, Textiles, Plasma jets, Nose cones, Flaps(Control surfaces), Thermal insulation, Fracture(Mechanics), Failure(Mechanics), Boost glide vehicles, Atmosphere entry, Aerodynamic heating, Environmental tests, Electric arcs, Ablation, Reviews

Identifiers: Spacecraft noses, NTISDODXD

AD-481 868/8ST NTIS Prices: PC$4.00/MF$3.00

The Analytical Determination of the Thermal Response of a Typical Aircraft Structure Subjected to Transient External Heating and Cooling

Air Force Flight Dynamics Lab Wright-Patterson AFB Ohio (012 070)

Final rept. 1 Jul 64-30 Jun 65
Bernstein, Thomas N., Maddux, Gene E., Engle, Robert M. Jr
D2461C3 Fld: 1C, 20D, 20M d7714
Feb 66 61p
Rept No: AFFDL-TR-65-219
Project: AF-1467
Task: 146702
Monitor: 18
Distribution limitation now removed.

Abstract: The thermal analysis is presented of a portion of the external surface thermal protection system and load bearing structure of a hypersonic vehicle, whose mission consists of a climb-out to 100,000 feet, cruise at Mach 6, descent, and a final phase, termed turn around, which includes landing rollout, refueling and maintenance. Temperature-dependent thermo-physical properties are utilized and compared to results obtained for constant thermo-physical properties.

Descriptors: (*Hypersonic aircraft, Aerodynamic heating), Airplane panels, Thermal insulation, Temperature control, Airframes, Mission profiles, Climbing, High altitude, Level flight, Descent, Aircraft landings, Refueling, Maintenance, Thermal properties, Temperature, Thermal radiation, Convection(Heat transfer), Cooling, Computer programming, Honeycomb cores, Sandwich construction, Thermal conductivity, Specific heat, Surface temperature

Identifiers: Skin(Structural member), NTISDODXD

AD-480 622/0ST NTIS Prices: PC$4.50/MF$3.00

High Reflectance Third Surface Mirror

Department of the Air Force Washington D C (109850)

Patent Application
Champetier, Robert J.
D1723L2 Fld: 20F, 22B, 46C, 90E, 84G GRAI7709
Filed 29 Sep 76 14p
Rept No: PAT-APPL-727 815
Monitor: 18
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Abstract: In the patent application the total solar thermal reflectance of spacecraft protective mirrors is improved by providing the back surface of a silica platelet with a first silver film 400 to 600 A thick and a second aluminum film at least 700 A thick. The mirror exhibits the reflectance of silver in the red band and the average reflectance of silver and aluminum in the violet band while providing hardness to nuclear radiation.

Descriptors: *Mirrors, *Spacecraft components, *Protective coatings, *Patent applications, Silicon dioxide, Silver, Aluminum, Substrates, Radiation effects, Solar radiation, Nuclear radiation protection

Identifiers: *Thermal control coatings, *Solar reflectors, PAT-CL-427-164, NTISGPAF

AD-D003 344/9ST NTIS Prices: PC$3.50/MF$3.00

An Analysis of the Scale Model Intermediate Bulkhead Tests

General Dynamics/Astronautics San Diego Calif (147 550)
Sherley, J. E.
D1612K3 Fld: 16D, 21H d7708
21 Nov 58 37p
Rept No: GDA-ZJ-7-063
Contract: AF 04(645)-4
Monitor: 18
Distribution limitation now removed.

Abstract: This report was prepared to document the results of a small scale model intermediate bulkhead test conducted at the Point Loma facility. The tests were initiated to determine if freezing of the fuel or excessive vigorous boiling of the liquid nitrogen would occur when the two were brought in contact with an intermediate bulkhead, and to measure the heat transfer across an insulated and an uninsulated bulkhead. It was expected that such information would provide an experimental basis for determining the feasibility of removing the intermediate bulkhead insulation on the 'C' and 'D' series missiles. (Author)

Descriptors: (*Surface to surface missiles, Propellant tanks), (*Propellant tanks, Thermal insulation), Correlation techniques, Hypergolic rocket propellants, Sustainer engines, Heat transfer, Feasibility studies, Models(Simulations), Test methods, Thermocouples, Helium, Cooling, Propellant control, Boiling, Model tests, Instrumentation, Equilibrium(Physiology), Mathematical analysis

Identifiers: Atlas, Boiloff, Cgm-16d missiles, Rp-1 fuel, NTISDODXD

AD-830 093/1ST NTIS Prices: PC$4.00/MF$3.00

G. E. Guidance and Inverter Environment Tests

General Dynamics/Astronautics San Diego Calif (147 550)
Gere, I. N.
D1603D3 Fld: 16D, 10B d7708
4 Jun 58 16p
Rept No: GDA-7B1630-1
Monitor: 18
Distribution limitation now removed.

Abstract: The test objectives were to determine the feasibility of mounting the missile inverter on the oxidizer tank and to determine if the guidance equipment could be mounted directly to the mounting rails on the oxidizer tank. (Author)

Descriptors: (*Surface to surface missiles, *Inverters), Propellant tanks, Control systems, Thermal insulation, Power supplies, Voltage, Liquid rocket propellants, Simulation, Model tests, Test methods

Identifiers: Atlas, Cgm-16b missiles, NTISDODXD

AD-829 259/1ST NTIS Prices: PC$3.50/MF$3.00

Model 7 Servo Valves, Electro-Hydraulic (99-33201-001 and 7-08353) Environmental Evaluation Testing of

General Dynamics/Astronautics San Diego Calif (147 550)
Denneny, J. A. Jr
D1602L1 Fld: 13G d7708
1 May 58 103p
Rept No: GDA-7A181, GDA-7A182
Monitor: 18
Distribution limitation now removed.

Abstract: The report presents the results of temperature, acceleration and vibration environment tests.

Descriptors: (*Servomechanisms, Performance(Engineering)), Vernier rocket engines, Environmental tests, Thermal stresses, Acceleration, Vibration, Acceptability, Guided missile components, Valves, Booster rockets, Hydraulic equipment, Surface to surface missiles, Attitude control systems

Identifiers: Closed loop systems, Control, Control systems, Graphs(Charts), NTISDODXD

AD-829 241/9ST NTIS Prices: PC$5.50/MF$3.00

Test Planning for in-Place Hardness Demonstration. Volume II. Methodology

Trw Systems Redondo Beach Calif (354 595)

Final technical rept. Jun 67-Jan 68
Stein, C. K., Karagozian, J., Bednar, J. P.
D1592E4 Fld: 16D, 20K d7708
15 Feb 68 51p
Rept No: 09365-6004-R0-00
Contract: F04694-67-C-0134
Monitor: SAMSO-TR-68-63-Vol-2
Distribution limitation now removed.

Abstract: This study has developed a test program plan for demonstrating the in-place hardness of an advanced ballistic missile weapon system. A test requirements analysis methodology was devised, utilizing a systems approach, to examine a system baseline design with respect to a given weapons effect environment criteria, define the testing required to assure hardness of each system element, trade off applicable simulation techniques, and recommend a series of test concepts. These concepts were then logically combined into efficient and cost-effective in-place hardness demonstration test programs for the launch facility and launch control facility. (Author)

Descriptors: (*Surface to surface missiles, Guided missile silos), (*Guided missile silos, Hardening), Structural properties, Mechanical properties, Systems engineering, Advanced weapons, Test methods, Models(Simulations), Nuclear explosions, Nuclear radiation, Attenuation, Debris, Doors, Shock waves, Vibration, Thermal radiation, Pressure, Scheduling, Loads(Forces), Costs, Cost effectiveness, Command and control systems

Identifiers: 120a program, Tradeoffs, NTISDODXD

AD-827 975/4ST NTIS Prices: PC$4.50/MF$3.00

Test Planning for in-Place Hardness Demonstration. Volume IV. Test Program Plan

Trw Systems Redondo Beach Calif (354 595)

Technical rept. (Final) Jun 67-Jan 68
Stein, C. K., Karagozian, J., Bednar, J. P.
D1592E1 Fld: 16D, 16A d7708
15 Feb 68 166p
Rept No: 09365-6006-RD-00
Contract: F04694-67-C-0134
Monitor: SAMSO-TR-68-63-Vol-4
Distribution limitation now removed.

Abstract: This study has developed a test program plan for demonstrating the in-place hardness of an advanced ballistic missile weapon system. A test requirements analysis methodology was devised, utilizing a systems approach, to examine a WS-120A system baseline design with respect to a given weapons effect environment criteria, define the testing required to assure hardness of each system element, trade off applicable simulation techniques, and recommend a series of test concepts. These concepts were then logically combined into efficient and cost-effective in-place hardness demonstration test programs for the launch facility and launch control facility. (Author)

Descriptors: (*Surface to surface missiles, Guided missile silos), (*Guided missile silos, Hardening), Advanced weapons, Systems engineering, Effectiveness, Test methods, Cost effectiveness, Command and control systems, Air force systems command, Analysis, Simulation, Communication systems, Tracking, Vulnerability, Scheduling, Blast, Nuclear explosions, Thermal radiation, Detonation waves, Transients, Response, Structural properties, Loads(Forces), Doors, Damage, Radiation effects, Debris, Vibration

Identifiers: NTISDODXD

AD-827 971/3ST NTIS Prices: PC$6.75/MF$3.00

Pod Insulation Test in B-1 Pod 'D' Aig Series, Ws 107A

General Dynamics/Astronautics San Diego Calif (147 550)
Laubach, C. H.
D1451C3 Fld: 9F, 20M, 16D d7707
13 Nov 59 89p
Rept No: GDA-27B-129-1
Monitor: 18
Distribution limitation now removed.

Abstract: This report defines methods and results of tests performed on missile equipment pods. The test objectives were to determine the temperature differential across two types of insulation, and compare moisture absorption of each material. The insulations were three-sixteenth inch of Styrofoam and one inch of Polyurethane foam. (Author)

Descriptors: (*Surface to surface missiles, Telemeter systems), (*Telemetering antennas, *Thermal insulation), Temperature control, Performance(Engineering), Styrene plastics, Isocyanate plastics, Transponders, Model tests, Guided missile safety, Pulses, Radar beacons

Identifiers: Atlas, Azusa, Xsm-65d missiles, NTISDODXD

AD-834 012/7ST NTIS Prices: PC$5.00/MF$3.00

Flight Proofing Test Report for Antenna Assembly, Telemeter/Range Safety Command, 'D' Series, Spec. No. 27-01202, DWG. No. 27-12507

General Dynamics/Astronautics San Diego Calif (147 550)
Thornton, P. L.
D1445C3 Fld: 9E, 9F, 16D d7707
20 Jun 59 50p
Rept No: GDA-7A1830-R
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of this report is to describe the test equipment an9d procedure required for the flight proofing of the antenna assembly, telemeter range safety command, missileborne, 'D' series, Drawing No. 27-12507, Specification No. 27-01202. (Author)

Descriptors: (*Telemeter systems, *Guided missile antennas), Flight testing, Simulation, Acceleration, Vibration, Failure, Cracks, Fairings, Mounting brackets, Thermal stability, Guided missile ranges, Altitude, Humidity, Surface to surface missiles, Guided missile safety, Command and control systems, Telemetering antennas

Identifiers: Atlas, Xsm-65d missiles, NTISDODXD

AD-833 928/5ST NTIS Prices: PC$4.00/MF$3.00

Pre-Production Test Report for Erection Mechanism Pillow Blocks, DWG. No. 27.09241

General Dynamics/Astronautics San Diego Calif (147 550)
Mandekic, S.
D1442B3 Fld: 13F, 16A, 16D d7707
22 Sep 59 27p
Rept No: GDA-7A2020-R
Monitor: 18
Distribution limitation now removed.

Abstract: This report presents test procedures and test results obtained from an analysis of an erector mechanism supporting pillow block assembly.

Descriptors: (*Surface to surface missiles, Guided missile launchers), (*Bearings, Performance(Engineering)), Quality control, Visual inspection, Humidity cabinets, Desert tests, Thermal shock, Salt spray tests, Life expectancy, Loads(Forces), Value engineering, Reliability

Identifiers: NTISDODXD

AD-833 332/0ST NTIS Prices: PC$4.00/MF$3.00

Pre-Production Test Report for the Quad IV Staging Disconnect Panel, DWG. No. 27-73507 and 27-20422

General Dynamics/Astronautics San Diego Calif (147 550)
Lowe, D. A.
D1441L2 Fld: 16D, 13E d7707
21 Sep 59 50p
Rept No: GDA-7A1900-R
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of the report is to describe the test equipment and procedures required for the pre-procuction testing of a missile staging disconnect panel.

Descriptors: (*Surface to surface missiles, Staging), (*Disconnect fittings, Performance(Engineering)), Quality control, Visual inspection, Leak detectors, Thermal stability, Desert tests, Humidity, Salt spray tests, Vibrators(Mechanical), Acceleration, Life expectancy, Pressure , Damage assessment

Identifiers: NTISDODXD

AD-833 322/1ST NTIS Prices: PC$4.00/MF$3.00

Pre-Production (Qualification) Test Requirements Purge System Local Control Box and Electrical Control Unit for Atlas 'D' Ioc

General Dynamics/Astronautics San Diego Calif (147 550)
Beye, W. R.
D1435K2 Fld: 21I, 9A, 16D d7707
25 Sep 59 23p
Rept No: GDA-AZN-27-139
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of this document is to establish test requirements for pre-production (qualification) testing of the purge system local control box and the purge system electrical control unit. The basic intent of these tests is to determine that the equipment functions properly when subjected to environmental test conditions simulating actual conditions of transportation, handling and use. (Author)

Descriptors: (*Propellant transfer, Control systems), (*Electrical equipment, Reliability(Electronics)), Test methods, Test equipment, Ground support equipment, Environmental tests, Temperature, Humidity, Altitude, Vibration, Shock(Mechanics), Thermal shock, Salt spray tests, Transportation, Storage, Surface to surface missiles

Identifiers: Atlas, Xsm-65d missiles, NTISDODXD

AD-833 195/1ST NTIS Prices: PC$3.50/MF$3.00

Production Evaluation Test Report on Receptacle - Umbilical, Propulsion and Rough Combustion Cutoff, DWG. No. 7-06392-3

General Dynamics/Astronautics San Diego Calif (147 550)
Law, E. G.
D1423B4 Fld: 16D, 16D d7707
6 Aug 59 24p
Rept No: GDA-27A2460-R
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of this report is to describe the test equipment and procedure required for the Quality Control Production Evaluation Test of the Receptacle - Umbilical, Propulsion and Rough Combustion Cutoff. (Author)

Descriptors: (*Surface to surface missiles, Umbilical cords(Aerospace)), (*Umbilical cords(Aerospace), *Electric connectors), Reliability(Electronics), Test methods, Test equipment, Quality control, Tolerances(Mechanics), Electrical resistance, Thermal stability, Voltage, Humidity, Vibration, Separation

Identifiers: NTISDODXD

AD-832 079/8ST NTIS Prices: PC$3.50/MF$3.00

Captive Testing of Missile 5A at Erb Test Stand 1-1

General Dynamics/Astronautics San Diego Calif (147 550)

Summary rept. no. 6.
D1412B1 Fld: 16D d7707
20 Mar 58 95p
Rept No: GDA-ZB-7-072-5A
Monitor: 18
Distribution limitation now removed.

Abstract This is the sixth Summary Report on captive testing and is an analysis of all captive tests on Missile 5A. Special tests were incorporated into the test of missile 5A in order to determine the causes for previously mentioned flight failures. The special testing covered in this report deals with the effectiveness of the heat shielding. This heat shielding was used in various configurations in an attempt to decrease engine compartment temperatures. (Author)

Descriptors: (*Surface to surface missiles, Flight testing), Captive tests, Failure, Airframes, Temperature, Convection(Heat transfer), Heat shields, Thermal radiation, Aluminum, Steel, Glass textiles, Liquid propellant rocket engines, Flight control systems, Hydraulic equipment, Pneumatic devices, Power supplies, Ground support equipment

Identifiers: Atlas, Xsm-65a missiles, NTISDODXD

AD-830 624/3ST NTIS Prices: PC$5.00/MF$3.00

Secoond Surface Thermal Control Mirrors for Reflection Control. Volume II. Annexes I thru X

General Dynamics/Convair San Diego Calif (147650)

Final technical rept. Mar 74-Mar 75
Neu, J. T., Dorian, M. F.
D1404H2 Fld: 22B, 20F, 46C, 84C, 84G GRAI7707
10 Jan 77 138p
Contract: F04701-74-C-0318
Project: 2132
Monitor: SAMSO-TR-76-92-Vol-2
See also Volume 1, AD-A034 863.

Abstract: Contents: Experimental Directional-Hemispherical Reflectance from 0.28 to 2.5 micrometers and Calculation of Solar Absorptance, Experimental Directional-Hemispherical Reflectance from 2.0 to 30 micrometers and Calculation of Thermal Emittance, Bidirectional Reflectance, Test Plan - Second Surface Mirrors, Hemispherical-Directional Reflectance 0.3 to 7.0 micrometers, Directional-Hemispherical Reflectance ERAS Format, Directional-Hemispherical Reflectance, and Directional Emittance 2.5 to 30 micrometers and 200 to 700 K, Directional-Hemispherical Reflectance (U.V., Vis, Near I.R.), Bidirectional Reflectance, Theory and Computer Programs for Substrate Design.

Descriptors: *Temperature control, *Spacecraft, *Reflectivity, Surface properties, Solar radiation, Diffuse reflection, Specular reflection, Etching, Hydrogen fluoride, Far infrared radiation, Tetrafluoroethylene resins

Identifiers: Second surface mirrors, Infrared mirrors, Optical coatings, NTISDODXA

AD-A034 864/9ST NTIS Prices: PC$6.00/MF$3.00

Second Surface Thermal Control Mirrors for Reflection Control. Volume I

General Dynamics/Convair San Diego Calif (147650)

Final technical rept. Mar 74-Mar 75
Neu, J. T., Dorian, M. F.
D1404H1 Fld: 22B, 20F, 46C, 84C, 84G GRAI7707
10 Jan 77 67p
Contract: F04701-74-C-0318
Project: 2132
Monitor: SAMSO-TR-76-92-Vol-1
See also Volume 2, AD-A034 864.

Abstract: This final report documents the results of a theoretical and experimental program to investigate ways to make second surface mirrors (e.g., thermal control surfaces, composed of thin transparent materials such as fused silica and FEP Teflon with a reflective backing, which are used on space vehicles) which are diffusely reflective but which retain the high solar reflectance of commercial specularly reflecting second surface mirrors. A number of designs were surveyed and four designs were fully evaluated. Three of these designs employed fused silica substrates with front or front and back surfaces ground with grinding compounds and then etched in a hydrogen fluoride solution. When suitably silverec on the back sides, these specimens met design goals. One of these designs employed a FEP Teflon substrate with front and back surfaces contoured by compression of Teflon sheet between quartz plates in a vacuum oven. When silvered on the back side, good diffuseness was obtained but solar reflectance was slightly degraded over the reflectance of commercial Teflon second surface mirrors. (Author)

Descriptors: *Temperature control, *Spacecraft, *Reflectivity, Surface properties, Specular reflection, Solar radiation, Etching, Hydrogen fluoride, Tetrafluoroethylene resins, Far infrared radiation, Diffuse reflection

Identifiers: Second surface mirrors, Infrared mirrors, Optical coatings, NTISDODXA

AD-A034 863/1ST NTIS Prices: PC$4.50/MF$3.00

Design Proofing Test Report for A/P Control Rate of Turn Gyroscope, Dwg. No. 55-04010-1

General Dynamics/Astronautics San Diego Calif (147 550)
Fernald, P.
D1224E4 Fld: 17G, 16D d7705
9 Dec 60 72p
Rept No: GDA-55A612R
Monitor: 18
Distribution limitation now removed.

Abstract: This report describes the test equipment and procedures required for design proof testing floated rate gyro control units.

Descriptors: (*Surface to surface missiles, Automatic pilots), (*Gyro stabilizers, Reliability(Electronics)), Electrical resistance, Vibration, Resonant frequency, Damping, Thermal shock, Life expectancy, Alignment

Identifiers: NTISDODXD

AD-843 815/2ST NTIS Prices: PC$4.50/MF$3.00

Development of a Procedure for Coating Propellant Utilization Manometer Housings

General Dynamics/Astronautics San Diego Calif (147 550)
Treadway, D. G.
D1215G2 Fld: 21I, 11C, 16D d7705
18 Aug 60 24p
Rept No: GDA-27E2463
Monitor: 18
Distribution limitation now removed.

Abstract: The objective of this test was to develop and test a method of controlling contaminants in 'D' and 'E' Series Propellant Utilization manometer housings so that contamination of the housings would minimize failures of the Propellant Utilization System. (Author)

Descriptors: (*Surface to surface missiles, *Propellant control), (*Manometers, *Protective treatments), Mandrels, Organic coatings, Manufacturing, Contamination, Reaction kinetics, Thermal stability, Aging(Materials), Capacitance, Visual inspection

Identifiers: Atlas, Ullage, Xsm-65d missiles, Xsm-65e missiles, NTISDODXD

AD-842 381/6ST NTIS Prices: PC$3.50/MF$3.00

Thermal Regulation of Functional Groups in Running Water Ecosystems. Progress Report, October 1, 1975--June 30, 1976

Michigan State Univ., Hickory Corners. W.K. Kellogg Biological Station.*Energy Research and Development Administration. (4127000)
Cummins, K. W., Klug, M. J.
D1072J4 Fld: 6F, 57H, 68D GRAI7704
Jul 76 105p
Contract: E(11-1)-2002
Monitor: 18

Abstract: Progress is reported on the following research projects: characterization of functional groups of running water organisms, particularly macroconsumers; studies on relationship of functional groups to qualitative and quantitative characteristics of organic inputs to stream ecosystems; studies on relationship of functional groups to thermal regimes; and dimensioning the control of feeding and growth by temperature and food quality and quantity and determining the extent of compensatory action of each. (ERA citation 02:001561)

Descriptors: *Aquatic ecosystems, *Aquatic organisms, *Feeding, *Growth, *Surface waters, *Thermal effluents, Biological effects, Control, Temperature effects, Thermal pollution

Identifiers: ERDA/520400, NTISERDA

COO-2002-25 NTIS Prices: PC$5.50/MF$3.00

Design Proofing Test of Heater Controller for Propellant Utilization Manometer

General Dynamics/Astronautics San Diego Calif (147 550)
Burgi, C. E.
D1013A3 Fld: 13A, 16D d7704
20 Oct 60 21p
Rept No: GDA-55B765-1
Monitor: 18
Distribution limitation now removed.

Abstract: This report presents the data obtained during the design proofing test on the Heater Controller for the Propellant Utilization Manometer. The objective of this test was to determine if the Heater Controller would perform satisfactorily under the anticipated operational environments. (Author)

Descriptors: (*Surface to surface missiles, Propellant control), (*Heaters, Control systems), Manometers, Reliability(Electronics), Thermal stability, Thermal shock, Vibration, Resonant frequency, Shock(Mechanics), Drop tests

Identifiers: NTISDODXD

AD-842 728/8ST NTIS Prices: PC$3.50/MF$3.00

Production Evaluation Test Report for Servo Cylinder-Hydraulic Autopilot, Booster, Missileborne, DWG. No. 27-08550-3, -5, -7

General Dynamics/Astronautics San Diego Calif (147 550)
Soltmann, J. D.
D1005J4 Fld: 13G, 21H, 16D d7704
18 May 60 96p
Rept No: GDA-7A2311-1-R
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of the report is to describe the test equipment and procedure required for the production evaluation testing of seven booster servo cylinders.

Descriptors: (*Booster rockets, *Hydraulic servomechanisms), (*Surface to surface missiles, *Flight control systems), Transducers, Automatic pilots, Coils, Electrical resistance, Pistons, Velocity, Life expectancy, Rupture, Tolerances(Mechanics), Thermal stability, Feedback, Response, Visual inspection

Identifiers: Closed loop systems, Control, Control systems, Evaluation, NTISDODXD

AD-842 129/9ST NTIS Prices: PC$5.00/MF$3.00

Lip Seal Evaluation and Development, Liquid Oxygen Staging Valve, 'E' Series

General Dynamics/Astronautics San Diego Calif (147 550)
D1005E1 Fld: 11A, 13K, 16D d7704
6 Jun 60 19p
Rept No: GDA-27A2480-R
Monitor: 18
Distribution limitation now removed.

Abstract: The object of the test was to evaluate the sealing ability of a new seal design to be incorporated in the 'E' series liquid oxygen staging valve and to develop a more effective seal if necessary. (Author)

Descriptors: (*Surface to surface missiles, Valves), (*Seals, Performance(Engineering)), Propellant control, Staging, Liquid rocket oxidizers, Gaskets, Pressurization, Fracture(Mechanics) , Leakage(Fluid), Thermal stability, Halocarbon plastics

Identifiers: Atlas, Tetrafluoroethylene resins, Xsm-65e missiles, NTISDODXD

AD-841 980/6ST NTIS Prices: PC$3.50/MF$3.00

Production Evaluation Test Report for Hose Assembly - Hydraulic, Missileborne, DWG. No. 27-08582

General Dynamics/Astronautics San Diego Calif (147 550)
Hinrichs, L.
D1004I2 Fld: 13K, 16D d7704
4 Apr 60 61p
Rept No: GDA-27A281
Monitor: 18
Distribution limitation now removed.

Abstract: This report describes production evaluation tests performed on missileborne hydraulic system hose assemblies.

Descriptors: (*Surface to surface missiles, *Hycraulic equipment), (*Hoses, Performance(Engineering)), Thermal shock, Thermal stability, Pressurization, Hydraulic pressure pumps, Hydraulic fluids, Life expectancy, Flexural strength., Deformation, Leakage(Fluid), Vibration, Curve fitting, Quality control

Identifiers: NTISDODXD

AD-841 892/3ST NTIS Prices: PC$4.50/MF$3.00

Pre-Production Test Report for Control-Rate of Turn, Autopilot CVA P/N 27-04301-1. Minneapolis-Honeywell Regulator Co. Model URT114 S/N 902B

General Dynamics/Astronautics San Diego Calif (147 550)
Fernald, P.
D0151I3 Fld: 17G, 16D d7701
24 May 61 81p
Rept No: GDA-27A-906
Monitor: 18
Distribution limitation now removed.

Abstract: This report describes the Pre-Production Testing of the Angular Rate Gyro. Testing was performed in accordance with Pre-Production Test Procedure and the results are contained herein. (Author)

Descriptors: (*Surface to surface missiles, Automatic pilots), (*Gyro stabilizers, Reliability), Stabilized platforms, Vibration, Resonant frequency, Sensitivity, Hysteresis, Electrical resistance, Fungusproofing, Thermal shock, Radiofrequency interference, Life expectancy

Identifiers: NTISDODXD

AD-851 558/7ST NTIS Prices: PC$5.00/MF$3.00

Control-Rate of Turn, Autopilot CVA Part No. 27-04574-1

General Dynamics/Astronautics San Diego Calif (147 550)

Evaluation test rept.
Fernald, P.
D0145K3 Fld: 17G, 16D d7701
27 Mar 61 58p
Rept No: GDA-27-A-959
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of the report is to describe the test equipment, test procedure, and results of the evaluation testing of an angular rate gyro.

Descriptors: (*Gyroscopes, Reliability(Electronics)), Vibration, Humidity, Acceleration, Thermal shock, Automatic pilots, Surface to surface missiles

Identifiers: Angular rate gyroscopes, Atlas, NTISDODXD

AD-851 391/3ST NTIS Prices: PC$4.50/MF$3.00

Critical Engine Components Minimum Temperature Study Missile 36D

General Dynamics/Astronautics San Diego Calif (147 550)
Ramsay, D. L.
D0145E1 Fld: 21H, 20M d7701
20 May 60 44p
Rept No: GDA-EM-1539
Monitor: 18
Distribution limitation now removed.

Abstract: The report presents the results of a critical engine components minimum temperature study using Missile 36D.

Descriptors: (*Surface to surface missiles, Liquid propellant rocket engines), (*Engine components, Thermal analysis), Heat transfer, Captive tests, Propellant transfer, Lubricants, Electric switches, Control systems

Identifiers: Atlas, Xsm-65d missiles, NTISDODXD

AD-851 313/7ST NTIS Prices: PC$4.00/MF$3.00

Production Evaluation Test of Control Rate Gyro (Ser. No. 490) CVA Part No. 27-04301

General Dynamics/Astronautics San Diego Calif (147 550)
Blanchard, D. D.
D0145D4 Fld: 17G, 16D d7701
5 May 60 46p
Rept No: GDA-27A-382-2
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of the report was to describe the test equipment and procedure required for the production evaluation testing of a floated rate gyro.

Descriptors: (*Gyroscopes, Reliability(Electronics)), Humidity, Vibration, Thermal stability, Liquid immersion tests, Surface to surface missiles

Identifiers: Atlas, NTISDODXD

AD-851 312/9ST NTIS Prices: PC$4.00/MF$3.00

Production Evaluation Test of Control Rate Gyro (Serial No. 296) CVA Part No. 27-04301-1

General Dynamics/Astronautics San Diego Calif (147 550)
Blanchard, D. D.
D0145C3 Fld: 17G, 16D d7701
25 Mar 60 78p
Rept No: GDA-27A-382-1R
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of the report was to describe the test equipment and procedure required for the production evaluation testing of components of a floated rate gyro.

Descriptors: (*Gyroscopes, Reliability(Electronics)), Humidity, Operation, Life expectancy, Radiofrequency interference, Liquid immersion tests, Thermal stability, Surface to surface missiles

Identifiers: Atlas, NTISDODXD

AD-851 305/3ST NTIS Prices: PC$5.00/MF$3.00

Flight Proofing Test Report for Abort Sensing and Control Unit Drawing No. 27-11111-821

General Dynamics/Astronautics San Diego Calif (147 550)
Galloway, R. N., Denneny, F. J.
D0144D4 Fld: 9A, 14D d7701
30 Mar 61 63p
Rept No: GDA-27A-824R
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of the report is to describe the test equipment and procedure required for the flight proofing of components of a 'square canister' containing six rate gyro output detectors, thirteen pressure switch output detectors and associated circuitry needed to supply two 'ready-abort' outputs as well as seventeen telemetry outputs. (Author)

Descriptors: (*Surface to surface missiles, Abort), Detectors, Control systems, Test methods, Humidity, Thermal stresses, Vibration, Acceleration, Pressure switches, Gyro stabilizers, Electrical properties, Manned spacecraft

Identifiers: NTISDODXD

AD-851 201/4ST NTIS Prices: PC$4.50/MF$3.00

Experimental Apparatus to Study Forced Convection Heat Transfer to Supercritical Cryogenic Hydrogen

Explosives Research and Development Establishment, Waltham Abbey (England).
Beech, J. C., Ziebland, H.
D0082I2 Fld: 21I, 81F STAR1421
1975 44p
Rept No: ERDE-TN-84, BR51432
Monitor: 18

Abstract: A detailed description of the flow cycle of a test rig designed and constructed for experimental studies of the heat transfer characteristics of supercritical hydrogen (energy-rich fuel for rocket propulsion) is presented together with details of construction and instrumentation of the electrically heated, square test section and all other associated instrumentation. In view of the hazards involved in experimenting with this fluid, special attention was paid to the development of automatic control and alarm devices. Brief reference is made to a few tentative trials to prove the proper functioning of all parts of the complex equipment. Surface temperatures and heat fluxes in the rectangular cross-section of the electrically heated tubes are estimated. (Author)

Descriptors: *Cryogenic rocket propellants, *Liquid hydrogen, Convective heat transfer, Forced convection, Automatic control, Automatic test equipment, Experimental design, Hydrogen-based energy, Supercritical flow, Surface temperature, Thermal conductivity, Warning systems

Identifiers: Great Britain, NTISNASAE

N76-30504/4ST NTIS Prices: PC$4.00/MF$3.00

Quality Verification and Conformance Procedures for RF Detector P/N 1563053 Sperry Farragut

Naval Weapons Center China Lake Calif (403 019)
C7803J4 Fld: 17G d7626
29 Nov 67 25p
Monitor: IDEP-941.32.10.00-X7-03
Supplement to Rept. no. IDEP-941.32.10.00-X7-02.
Distribution limitation now removed.

Abstract: The document provides test procedures to be followed in performing quality verification and quality conformance on an RF detector. (Author)

Descriptors: (*Detectors, Reliability(Electronics)), Air to surface missiles, Radiofrequency, Radar homing, Visual inspection, Mechanical properties, Electrical properties, Thermal properties, Life expectancy, Quality control, Waveguides

Identifiers: Agm-45 missiles, Evaluation, Shrike missiles, NTISDODXD

AD-858 311/4ST NTIS Prices: PC$3.50/MF$3.00

Illustrative Generic Standard for the Control of Thermal Burn Hazards in Household Appliances

National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.*Consumer Product Safety Commission, Bethesda, Md. (400 614)

Final rept.
Hendrickson, Robert G., Robertson, Elizabeth M., Kelly, Rudolph V.
C7691K2 Fld: 5A, 9C, 96D, 49, 86V GRAI7625
30 Jun 76 49
Rept No: NBSIR-76-1097
Project: NBS-4411432, NBS-4412432
Monitor: 18
Sponsored in part by Consumer Product Safety Commission, Bethesda, Md.

Abstract: The document reports on the development of an illustrative generic standard for controlling hot surfaces associated with certain categories of consumer products. The development includes evaluations of accident data, fault-tree diagrams, theoretical heat-flow phenomena, current standards, and application of the thermesthesiometer as a test instrument. This work is a companion to the Guidelines for the Development of Generic Safety Standards, and as such, it applies the methods and techniques provided in the Guidelines. The principal tool of analysis is the fault-tree method. This method brings to safety problems a versatile and insightful way of depicting events, conditions, and causes associated with hazards and accidents. The intent is to demonstrate the feasibility of the generic approach to controlling safety aspects of consumer products.

Descriptors: *Electric appliances, *Consumer affairs, *Product safety, *Burns(Injuries), Standards, Safety factors, Surfaces, Temperature, Hazards, Accidents, Heat transmission, Reliability

Identifiers: Consumer products, Fault tree analysis, NTISCOMNBS, NTISEXCPSC

PB-257 141/2ST NTIS Prices: PC$4.00/MF$3.00

Application Analysis of Electron Tubes V302 and V303 in the SIDEWINDER and CHAPARRAL Guidance Control Group

Naval Weapons Center China Lake Calif (403 019)
Willms, D. G., Marshall, J.
C7642D3 Fld: 9A d7625
28 Feb 69 17p
Monitor: IDEP-361.57.20.00-X7-01
Distribution limitation now removed.

Abstract: The report describes the results of an application analysis of electron tubes V302 and V303 (NAVAIR Drawing No. 2412489) in Sidewinder and Chaparral Guidance Control Croups. (Author)

Descriptors: (*Electron tubes, Reliability(Electronics)), Surface to air missiles, Failure(Electronics), Heat sinks, Thermal analysis

Identifiers: Chaparral missiles, Sidewinder, NTISDODXD

AD-866 416/1ST NTIS Prices: PC$3.50/MF$3.00

Cooled Metal Laser Mirrors - State-of-the-Art Review

Frankford Arsenal Philadelphia PA (142 720)

Memorandum rept.
Cytron, Sheldon J.
C7354L3 Fld: 20E, 20F d7622
Jun 73 28p
Rept No: FA-M73-17-1
Monitor: 18
Distribution limitation now removed.

Abstract: This report is a state-of-the-art review of coolec metal laser mirror technology. The design philosophy anc parametric tradeoffs underlying cooled laser mirror cesigns are presented. Various construction aspects of coolec metal laser mirrors are discussed, along with the fabrication techniques employeu in the assembly of the mirror. Areas that need further developmental work are reviewed, anc recommendations for specific study and development efforts are made to deal with future laser mirror requirements. (Author)

Descriptors: (*Lasers, State-of-the-art reviews), (*Mirrors, Lasers), Cooling, Metals, Surfaces, Construction, Manufacturing, Assembly, Optics, Heat transfer, Cesign, Coatings, Quality control, Tracking, Beams(Electromagnetic), Distortion, Reflection, Heat flux, Effectiveness, Convection(Heat transfer), Structural members, Thermal expansion, Reflectivity, Polishes, Optical equipment components

Identifiers: NTISDODXD

AD-912 698/8ST NTIS Prices: PC$4.00/MF$3.00

Individual Motor Report M55A1 Minuteman Operational Quality Assurance Rocket Motor QA-1206, 0013837

Thiokol Chemical Corp Brigham City Utah Wasatch Div (401 261)

Technical operating rept.
C7352D1 Fld: 21H, 16D d7622
14 Jun 73 92p
Rept No: TWR-7192
Contract: F04701-71-C-0064
Monitor: 18
Distribution limitation now removed.

Abstract: The motor ignited and performed satisfactorily in all parameters throughout action time. All required parameters were within the limits prescribed by the Wing VI Operational model Specification, S-133-1001-0-3. Post-test inspection indicated satisfactory performance of all motor components. (Author)

Descriptors: (*Booster rockets, Surface to surface missiles), (*Solid propellant rocket engines, Captive tests), Quality control, Reliability, Thrust vector control systems, Rocket nozzles, Ignition, Thrust, Specific impulse, Graphite, Nozzle inserts, Thermal insulation, Rings, Rocket engine cases, Visual inspection, Performance(Engineering)

Identifiers: Minuteman, *M-55a1 motors, M-55 motors, NTISDODXD

AD-910 743/4ST NTIS Prices: PC$5.00/MF$3.00

F-106A Nuclear Vulnerability Analysis. Volume III. Blast and Thermal Appendixes

Braddock Dunn and Mcdonald Inc Albuquerque N Mex (389 080)

Technical rept. Jun 69-Nov 70.
C7332C3 Fld: 1C, 15F d7622
Aug 72 492p
Rept No: BDM/A-72-70-TR/R1-Vol-3
Contract: F29601-69-C-0139
Project: AF-3763
Task: 376301
Monitor: AFSWC-TR-70-7-Vol-3
See also Volume 2, AD-522 485L.
Distribution limitation now removed.

Abstract: This volume contains six appendixes which augment the blast and thermal analysis presented in Volume II. In the first, there is a detailed description of the general F-106A mission profile, including scramble, takeoff, attack, return to base, etc. The second contains a description of the effects that partial degradation or complete loss of individual secondary structural elements would have upon overall performance capabilities of the F-106A aircraft. Appendix III includes presentations of the integral equation and F-106A fuselage cross-sectional data which were used to evaluate secondary structure preloading effects at supersonic speeds prior to thermal and overpressure analyses. Appendix IV contains the separated form of the kernel function that was used in the subsonic aerodynamic loading analysis. Appendix V contains the F-106A dynamic response models, i.e., mass matrices, stiffness matrices, natural frequencies; and mode shapes, which were used in the gust analysis. The last contains influence coefficient data used to calculate aerodynamic pressure distributions for the subsonic wing, subsonic fin, supersonic wing, and supersonic fin.

Descriptors: (*Jet fighters, Vulnerability), (*Nuclear explosion damage, Jet fighters), Aerodynamic loading, Supersonic flight, Thermal stresses, Mission profiles, Airframes, Structural properties, Degradation, Performance(Engineering), Mathematical models, Fuselages, Gusts, Subsonic characteristics, Supersonic characteristics, Integral equations, Matrices(Mathematics), Aircraft equipment, Aerodynamic control surfaces, Pressure, Blast, Stresses, Response

Identifiers: F-106a aircraft, F-106 aircraft, Overpressure, NTISDODXD

AD-904 331/6ST NTIS Prices: PC$12.50/MF$3.00

Battery, Thermal

Naval Weapons Center China Lake Calif (403 019)

Final specification.
C7305F1 Fld: 10C, 16D, 16D d7622
8 Mar 71 26p
Rept No: Spec-AS-1531
Monitor: GIDEP-101.50.00.00-X7-01S
Distribution limitation now removed.

Abstract: This purchase description covers one type of thermal battery intended for use as an electrical power supply during flight for the SIDEWINDER and CHAPARRAL Guidance and Control Groups (Mark 18 and Mark 28, respectively). (Author)

Descriptors: (*Thermal batteries, Specifications), (*Guided missile batteries, Thermal batteries), Naval procurement, Air to air missiles, Surface to air missiles, Power supplies, Command and control systems, Standards, Military requirements, Voltage, Environmental tests, Quality control, Test methods, Acceptability

Identifiers: Chaparral missiles, Mark-18 guidance and control group, Mark-28 guidance and control group, Sidewinder, NTISDODXD

AD-892 979/6ST NTIS Prices: PC$4.00/MF$3.00

Temperature and Pressure Profiles Obtained during Burn of a SPARROW MK 38 Mod 0 or Mod 1 Motor in a 15,300 Cubic-Foot Magazine. Part II

Naval Surface Weapons Center Dahlgren Lab VA (391 598)

Technical rept.
Hanzel, Frank J., Berkey, Charles L., Miller, Richard E. Jr
C7261J2 Fld: 21H, 21B, 81K, 81A GRAI7622
Oct 74 106p
Rept No: NSWC/DL-TR-3141
Project: S4643
Task. 15925
Monitor: 18
See also Part 1, Rept. no. NSWC/DL-TR-3140, AD-B001 037L and also Rept. no. NSWC/DL-TR-3139, AD-b000 464L.
Distribution limitation now removed.

Abstract: SPARROW MK 38 MOD 0 or MOD 1 motors were ignited in two tests in an instrumented 15,300 cubic-foot magazine under conditions simulating accidental ignition of these motors in shipboard service using the wet or dry sprinkler system as the damage control mechanism. The results provided a detailed temperature and pressure profile in the magazine; and thermal characteristics for bare, inert, instrumented ZUNI motors, bare, inert, instrumented, all-up configuration of SIDEWINDER and ZUNI missiles, and inert, instrumented, containerized. all-up SIDEWINDER and ZUNI missiles located in the magazine. Temperatures and pressures within the magazine reached a peak of 1185 F and 19.3 psig. external and internal temperatures for the instrumented, inert ordnance peaked at 1200 F and 455 F, respectively. Data from these tests will assist in evaluating the relative effectiveness of the wet vs. dry sprinkler system in preventing chain reaction of ordnance in deep stowage magazines during motor burn, and in evaluating thermal systems designed for explosive ordnance. (Author)

Descriptors: (*Solid propellant rocket engines, Air to air missiles), Combustion, Temperature, Pressure, Profiles. Sprinklers, Fire extinguishers, Aircraft carriers, Shipboard, Accidents, Storage, Sizes(Dimensions), Simulation, Damage control, Cook off, Thermal properties, Rupture, Venting. Captive tests, Ignition, Thermocouples, Time

Identifiers: Ammunition magazines, Sympathetic detonations, Zuni, Sparrow, *Mark-38 motors, Mark-38 Mod-D motors, Mark-38 Mod-1 motors, AALW(Assembled Air Launched Weapons), Assemblec Air Launched Weapons, NTISDODXD

AD-B001 088/4ST NTIS Prices: PC$5.50/MF$3.00

Temperature and Pressure Profiles Obtained during Burn of a SPARROW MK 38 MOD 0 or MOD 1 Motor in a 15,300 Cubic-Foot Magazine. Part I

Naval Surface Weapons Center Dahlgren Lab VA (391 598)

Technical rept.
Hanzel, Frank J., Berkey, Charles L., Miller, Richard E. Jr
C7261I2 Fld: 21H, 21B, 81K, 81A GRAI7622
Nov 74 143p
Rept No: NSWC/DL-TR-3140
Project: S4643
Task: 15925
Monitor: 18
See also Rept. no. NSWC/DL-TR-3139, AD-B000 464L. See also Part-2, AD-B001 088L.
Distribution limitation now removed.

Abstract: SPARROW MK 38 MOD 0 or MOD 1 motors were ignited in three tests in an instrumental 15,300 cubic-foot magazine under conditions that would simulate accidental ignition of the motor under shipboard service conditions using the wet or dry sprinkler system as the damage control mechanism. The results provided a detailed temperature and pressure profile in the magazine; and thermal characteristics for bare, inert, instrumented ZUNI motors, bare, inert, instrumented, all-up configuration of SIDEWINDER and ZUNI missiles, and inert, instrumented, containerized, all-up SIDEWINDER and ZUNI missiles located in the magazine. Temperatures and pressures within the magazine reached a peak of 1200 F and 19 psig. External and internal temperatures for the instrumented, inert ordnance peaked at 915 F and 460 F, respectively. Data from these tests will assist in evaluating the relative effectiveness of the wet vs dry sprinkler system in preventing chain reaction of ordnance in deep-stowage missile magazines during motor burn, and in evaluating thermal systems designed for explosive ordnance. (Author)

Descriptors: (*Solid propellant rocket engines, Air to air missiles), Combustion, Temperature, Pressure, Profiles, Ignition, Shipboard, Simulation, Storage, Aircraft carriers, Thermal properties, Captive tests, Cook off, Sizes(Dimensions), Fire extinguishers, Sprinklers, Rupture, Deflagration, Venting, Accidents, Thermocouples, Time, Damage control

Identifiers: *Sparrow, Mark-38 Mod-0 motors, Mark-38 Mod-1 motors, Mark-38 motors, AALW(Assembled air launched weapons), Assembled air launched weapons, *Zuni, Ammunition magazines, Sympathetic detonations, NTISDODXD

AD-B001 037/1ST NTIS Prices: PC$6.00/MF$3.00

Temperature and Pressure Profiles Obtained During Burn of a Sidewinder Mk 17 Mod 5 Motor in a 15,300 Cubic-Foot Magazine

Naval Surface Weapons Center Dahlgren Lab VA (391 598)

Technical rept.
Hanzel, Frank J., Berkey, Charles L., Miller, Richard E. Jr
C7261F4 Fld: 21H, 21B, 81K, 81A GRAI7622
Sep 74 101p
Rept No: NSWC/DL-TR-3139
Project: S4643
Task: 15925
Monitor: 18
Distribution limitation now removed.

Abstract: SIDEWINDER Mk 17 MOD 5 motors were ignited in two tests in an instrumented, 15,300 cubic-foot missile magazine under conditions which would simulate accidental ignitions of this motor under shipboard service conditions. The results established a detailed temperature and pressure profile in the magazine, and the thermal characteristics of inert, instrumented ZUNI motors located in the magazine. Temperatures and pressures within the magazine reached peaks of 570 F and 5.1 psi, respectively, external and internal temperatures for the instrumented ZUNI motors peaked at 175 F and 100 F, respectively, which would not have caused cook-off had the motors been live. Environmental conditions in the magazine were not as severe as expected. (Author)

Descriptors: (*Solid propellant rocket engines, Air to air missiles), Temperature, Pressure, Profiles, Captive tests, Ignition, Storage, Aircraft carriers, Cook off, Sprinklers, Fire extinguishers, Thermal properties, Damage control, Time, Shipboard, Accidents, Combustion, Sizes(Dimensions), Afterburning, Plumes, Exhaust gases, Oxygen, Hydrogen, Carbon monoxide, Carbon dioxide, Thermocouples, Transducers

Identifiers: *Sidewinder, Mark-17 mod-5 rocket motors, *Mark-17 motors, Zuni, AALW(Assembled air launched weapons), Assembled air launched weapons, Ammunition magazines, Sympathetic detonations, NTISDODXD

AD-B000 464/8ST NTIS Prices: PC$5.50/MF$3.00

Modal Wavefront Control System (MOWACS)

Perkin-Elmer Corp Norwalk Conn Electro-Optical Div*Naval Surface Weapons Center, White Oak Lab., Silver Spring, Md. (279560)

Final rept. on Phase 2, Aug 75-Jul 76
Neufeld, C.
C7175K1 Fld: 20F, 17H, 46C*, 63F GRAI7621
2 Jul 76 90p
Rept No: PE-13039
Contract: N60921-75-C-0148
Monitor: 18

Abstract: MOWACS (Modal Wavefront Control System) is a form of Coherent Optical Adaptive Techniques (COAT) used to obtain information required to correct turbulence and thermal blooming aberrations characteristic of high energy lasers in the atmosphere. The feasibility of replacing complex multi-segment mirror COAT systems with continuously deformable mirrors was established in Phase I. In Phase II the system was upgraded to include a 100 Hz bandwidth closed loop system and to allow the introduction of more sophisticated aberrations.

Descriptors: *Optical radar, *Mirrors, *Laser beams, *Thermal blooming, Turbulence, Atmospheric motion, Corrections, Vibration, Self organizing systems, Light transmission, Computerized simulation

Identifiers: *Atmospheric transmissivity, Coherent Optical Adaptive Techniques, Atmospheric attenuation, Adaptive optics, Modal Wavefront Control System, NTISDODN

AD-A028 298/8ST NTIS Prices: PC$5.00/MF$3.00

Production Engineering Measures to Manufacture Super Fine Finish Beryllia

Brush Wellman Inc Cleveland Ohio (390594)

Quarterly progress rept. no. 6, 1 Jan-31 Mar 76
Rees, Glenn H.
C7002L3 Fld: 11B, 13H, 71D, 94G GRAI7619
10 Apr 76 28p
Rept No: BW-TR-576
Contract: DAAB07-74-C-0606
Project: DA-2749656
Monitor: 18

Abstract: Progressive polishing of beryllia substrates was demonstrated on manufacturing scale equipment. Working surfaces with 2 to 3 microinches smoothness were produced. The input substrates were commercially available 99.5% BeO parts of 1 in. x 1 in. and 2 in. x 2 in. dimensions. The physical, electrical, and thermal properties met or exceeded the modified specification requirements. (Author)

Descriptors: *Beryllium oxides, *Polishing, Surface finishing, Substrates, Abrasion, Physical properties, Electrical properties, Thermal properties, Quality control

Identifiers: Production engineering measures, Manufacturing, NTISDODXA

AD-A026 885/4ST NTIS Prices: PC$4.00/MF$3.25

The Prospero Thermal Control Surfaces Experiment

Royal Aircraft Establishment Farnborough (England) (310450)

Technical rept.
Keyte, G. E.
C6994K3 Fld: 22B, 20M, 13A GRAI7619
Dec 75 105p
Rept No: RAE-TR-75123
Monitor: DRIC-BR-50460

Abstract: The Prospero thermal control surfaces experiment was conceived as a method of investigating the behaviour of various thermal control surface materials in a space environment. This Report contains the results of laboratory tests on selected materials, the design and construction of the experiment and the analysis of data obtained from the flight of the Prospero spacecraft. It concludes that, while the experiment was not sensitive enough to measure changes in surface radiation properties accurately, it was possible to identify some surfaces as being satisfactory for use and reject others as being completely unsatisfactory. (Author)

Descriptors: *Temperature control, *Spacecraft, Surface properties, Solar radiation, Emittance, Infrared radiation, Ultraviolet radiation, Periodic variations, Surface temperature, Rotation, Gold, Great Britain

Identifiers: Prospero spacecraft, TCSE(Thermal control surfaces experiment), Thermal control surfaces experiment, *Scientific satellites, NTISDODXA

AD-A026 737/7ST NTIS Prices: PC$5.50/MF$2.25

Spacecraft Thermal Control Design Data, Volume 1

Polytechnical Univ. of Madrid (Spain). School of Aeronautics.
C6755F1 Fld: 22B, 84G STAR1411
May 75 674p
Rept No: ESA-CR(P)-753-V-1
Contract: ESTEC-2124/73-AK
Monitor: 18
Seri-2. Subm-Prepared Jointly with Dornier System.

Abstract: Properties and characteristics in the following areas are presented in the form of tables and graphs: view factors; spacecraft surface temperatures; spacecraft construction materials; thermal conductance of joints; and thermal control coatings.

Descriptors: *Joints (Junctions), *Light alloys, *Spacecraft construction materials, *Surface properties, *View effects, Chemical properties, Heat resistant alloys, Physical properties, Satellite temperature, Shapes, Spacecraft design, Spacecraft structures, Surface geometry, Surface properties, Surface temperature, Temperature control, Thermal conductivity , Thermal control coatings

Identifiers: Spain, NTISNASAE

N76-20197/9ST NTIS Prices: PC$16.25/MF$2.25

Semiconductor Measurement Technology: Progress Report January 1 to June 30, 1975

National Bureau of Standards, Washington, D.C. Electronic Technology Div.*Advanced Research Projects Agency, Arlington, Va.*Defense Nuclear Agency, Washington, D.C.*Strategic Systems Project Office (Navy), Washington, D.C. (405 289)

Interim rept.
Bullis, W. Murray
C6574F4 Fld: 14B, 20L, 13H, 09A, 46D, 94B, 49H, 86V GRAI 7613
Apr 76 98p
Rept No: NBS-Special Pub-400-19
Contract: ARPA Order-2397
Monitor: 18
See also report dated Nov 75, AD-A017 523. Sponsored in part by Defense Nuclear Agency, Washington, D.C., and Strategic Systems Project Office (Navy), Washington, D.C.

Abstract: This progress report describes NBS activities directed toward the development of methods of measurement for semiconductor materials, process control, and devices. Both in-house and contract efforts are included. The emphasis is on silicon device technologies. Principal accomplishments during this reporting period included (1) completion and analysis of an interlaboratory evaluation of standard reference wafers for resistivity measurement by the four-probe method, (2) analysis of the effect of finite contact size on sheet resistance as measured with a van der Pauw structure, (3) calculation of errors introduced in measuring line width with typical microscope systems, (4) development of procedures for predicting the magnitude of electron beam induced current in silicon device structures, (5) application of the optical flying-spot scanner to observation of hot spots and nonlinearities in UHF power transistors and of logic patterns in an MOS shift register, and (6) determination of a more accurate electrical method, based on peak junction temperature measurement, to establish safe operating area curves for medium power transistors.

Descriptors: *Semiconductors, *Semiconductor devices, *Quality control, *Tests, Measurement, Surface properties, Electrical resistance, Nondestructive tests, Bonding, Thermal properties, Hermetic seals, Test equipment

Identifiers: Ion implantation, NTISCOMNBS, NTISDODA, NTISDODN

PB-251 844/7ST NTIS Prices: PC$5.00/MF$2.25

Improvement of Solar Cell Covers. Volume 1: General Presentation

Pilkington Bros. Ltd., Ormskirk (England).

Final Report.
Creyke, W. E. C., Gulley, J. E. C.
C6122A1 Fld: 10B, 97D STAR1404
4 Mar 75 34p
Rept No: SC/75/16-V-1, ESA-CR(P)-702-V-1
Contract: ESTEC-2233/74-AK
Monitor: 18
Seri-2.

Abstract: In an effort to improve fabrication processes and quality control measures, attempts were made to identify and define critical characteristics process parameters which affect the mechanical and thermal properties of solar cell cover slides. Mechanical and thermal cycling tests were carried out on 5 batches of cover slides to quantify differences caused by defects identified by special QA procedures, geometrical factors, and variations in processing parameters. Of the defects identified only severe surface scratches lowered the fracture load and geometrical factors had little effect. No advantage was found in selecting glass from the drawn ribbon on a more restrictive basis than is used at present. Etching of the edges produced a higher proportion of strong cover slides but did not completely eliminate weak ones. Failures due to repeated thermal cycling from 200 C into liquid nitrogen were very rare and were not affected by process parameters of defects. (Author)

Descriptors: *Coverings, *Glass, *Quality control, *Solar arrays, *Solar cells, Etching, Surface defects, Thermal cycling tests

Identifiers: NTISNASAE

N76-13205/9ST NTIS Prices: PC$4.00/MF$2.25

Development and Testing of the Infrared Radiometer for the Mariner Venus/Mercury 1973 Spacecraft

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Clarke, T. C.
C4682H2 Fld: 14B STAR1310
1 Feb 75 70p
Rept No: NASA-CR-142090, JPL-TM-33-719
Contract: NAS7-100
Monitor: 18

Abstract: The science objectives, development history, functional description, and testing of the Mariner Venus/Mercury 1973 infrared radiometer are discussed. Included in the functional description section is a thorough discussion of the IRR optical system, electronic operation, and thermal control. Signal development and its conversion to engireering units is traced, starting with the radiant space object, passing through the IRR optics and electronics, and culminating with data number development and interpretation. The test program section includes discussion of IRR calibration and alignment verification. Finally, the problems and failures encountered by the IRR during the period of its development and testing are reviewed. (Author)

Descriptors: *Infrared radiometers, *Mariner venus-mercury 1973, *Spacecraft instruments, Electronic equipment, Optical equipment, Planetary surfaces, Temperature control, Thermal radiation

Identifiers: NTISNASA

N75-18308/7ST NTIS Prices: PC$4.25/MF$2.25

Semiconductor Measurement Technology

National Bureau of Standards Washington D C (240800)

Quarterly rept. 1 Apr-30 Jun 74
Bullis, W. Murray
C4285B3 Fld: 9A, 20L, 46D, 49H GRAI7508
Feb 75 73p
Rept No: NBS-Special Pub 400-8
Contract: ARPA Order-2397
Monitor: 18
Paper copy also available from GPO as C13.10:400-8.
*Advanced Research Projects Agency, Arlington, Va.

Abstract: ;Contents: Resistivity; dopant profiles; Crystal defects and contaminants; Oxide film characterization; Test patterns; Photolithography; Epitaxial layer thickness; Wafer inspection and test; Interconnection bonding; Hermeticity; Thermal properties of devices.

Descriptors: *Semiconductors, *Semiconductor devices, *Quality control, Electrical resistance, Surface properties, Doping, Silicon, Capacitors, Transistors, Metal oxide semiconductors, Bonded joints, Semiconducting films, Thickness, Test methods, Photolithography, Hermetic seals, Semiconductor diodes, Electron microscopy, Thermal properties, Microelectronics, Cooling, Reliability(Electronics), Mathematical models, Crystal defects, Intergrated circuits

Identifiers: NTISDODSD

AD/A-005 669/7ST NTIS Prices: PC$4.25/MF$2.25

Computer Simulation of Optimal Control of an Integrated Human Thermal System by Response Surface Methodology

Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.*National Science Foundation, Washington, D.C. (404 609)
Hwang, C. L., Fan, L. T., Konz, S. A., Ozarkar, H. N.
C3434C4 Fld: 6Q, 13A, 95C GRAI7421
Aug 74 78p
Rept No: ISDO-59
Grant: NSF-GK-41206
Monitor: 18

Abstract: The optimal policy for controlling an integrated human thermal system (the body and a water-cooled garment on the head and torso) was determined by the response surface methodology. This methodology finds empirically and systematically the optimal control policy; this report, however, presents a scheme based on the method for carrying out a prior computer simulation of the experimental search for the optimum control. The objective of the control was to minimize the control effort for operating the external thermal regulation device while maintaining a state of thermal comfort (thermoneutrality).

Descriptors: *Cooling systems, *Protective clothing, Temperature control, Computerized simulation, Mathematical models, Experimental data, Heat stress, Metabolism

Identifiers: *Water cooled suits, *Personal cooling systems, Thermal comfort, NTISNSF

PB-234 660/9 NTIS Prices: PC$7.00/MF$2.25

Active Control of Primary Mirror of an Orbiting Telescope with Thermal Excitation

Alabama Univ., Huntsville. Bureau of Engineering Research.

Final Report.
Hill, J. L., Youngblood, J. N.
C3154H1 Fld: 22B, 84G STAR1213
Mar 74 76p
Rept No: NASA-CR-120214, BER-171-09
Contract: NAS8-28019
Monitor: 18

Abstract: The generalization is presented that was made to model a layered structure of a kind that represents a light-weighted mirror. This theory is presented along with the strategy for error suppression. The results of a variety of error-suppression studies are also presented. The computer programs for all parts of this study are included. (Author)

Descriptors: *Mirrors, *Spaceborne telescopes, Computer programs, Error analysis, Excitation, Mechanical properties, Surface properties, Thermodynamic properties

Identifiers: NTISNASA

N74-22099/7 NTIS Prices: PC$7.00/MF$1.45

Processes, Procedures, and Methods to Control Pollution Resulting from Silvicultural Activities

Environmental Protection Agency, Washington, D.C. (390 139)
C2305H1 Fld: 2F, 13B, 48D*, 68D GRAI7406
Oct 73 102p*
Rept No: EPA-430/9-73-010
Monitor: W74-02946
Paper copy also available from GPO $1.25 as EP1.23:403-73-010.

Abstract: This report provides information of a general nature regarding processes, procedures, and methods for controlling pollution caused by sediment runoff from logging roads, skid trails, and other areas of disturbed soils in forest areas; pesticides and fertilizers used in forest regeneration activities; chemicals and other materials applied for forest fire prevention; and temperature increases in small streams exposed to solar radiation by logging of bordering timber stands. It is intended to act as a state-of-the-art document useful for the development of effective programs to control nonpoint sources of pollution.

Descriptors: *Forestry, *Water pollution, Lumbering, Soil erosion, Insecticides, Herbicides, Fertilizing, Surface water runoff, Reforestation, Management, Land use

Identifiers: *Water pollution control, Thermal pollution, EPAOWP

PB-226 658/3 NTIS Prices: PC$3.25/MF$1.45

Damage Threshold Studies of Glass Laser Materials

Owens-Illinois Inc Toledo Ohio Consumer and Technical Products Div (405544)

Final technical rept.
Boling, N. L., Crisp, M. D., Dube, G., Spanoudis, L., Wengert, P. R.
C0101B3 Fld: 20E, 80G GRAI7302
30 Jun 72 69
Contract: DAHC15-69-C-0303, ARPA Order-1441
Monitor: 18
See also report dated 31 Dec 71, AD-736 998.

Abstract: A summary of recent investigations of surface damage of transparent dielectrics is presented. For 30 nsec pulses at normal incidence, exit surface damage thresholds are typically 100 j/sq cm for ED-2 laser glass. Asymmetry between the entrance and exit surface damage thresholds is explained by considering electric field strengths at the surfaces. The morphology of surface damage is described and a model based upon reflections from the laser induced plasma is proposed. The problem of Platinum inclusions is not completely solved. Careful attention to the melting procedure has produced glass capable of withstanding energy densities much higher than the 10-20 j/sq cm (30 nsec) limit of several years ago. Continuation of this approach holds promise of completely eliminating Platinum inclusions from laser glass. (Author)

Descriptors: (*Lasers, Optical glass), (*Optical glass, Radiation damage), Coherent radiation, Thermal radiation, Light pulses, Platinum, Cerium, Oxides, Defects(Materials), Surface properties, Quality control

Identifiers: *Laser materials, Neodymium glass lasers, Laser beams

AD-752 549 NTIS Prices: PC$3.00/MF$0.95

Method of Calculating Boundary Conditions at the Surface of a Control Assembly in a Vver-Type Reactor

Valtion Teknillinen Tutkimuskeskus, Otaniemi (Finland). Ydinvoimatekniikan Lab. (6658700)
Wasastjerna, F.
A7225E2 Fld: 18E, 77H NSA3301
Feb 74 49p
Monitor: 18
U.S. Sales Only.

Abstract: For abstract, see NSA 33 01, number 02292.

Descriptors: (*Wwer type reactors, *Fast neutrons), Boundary conditions, Control elements, Flux density, Fuel cells, Fuel pins, Multigroup theory, Neutron diffusion equation, Neutron flux, T codes, Thermal neutrons

Identifiers: NTISERDA

VTT-YDI-11 NTIS Prices: PC$4.00/MF$2.25

Contamination Control Training Manual

General Electric CO., St. Petersburg, Fla. (Usa). Neutron Devices Dept. (2694000)
Meeks, R. F.
A6553H3 Fld: 13B, 68 NSA3002
1 Apr 74 165p
Contract: AT(29-2)-656
Monitor: 18

Abstract: For abstract, see NSA 30 02, number 05695.

Descriptors: (*Pollution, *Control), (*Environment, Contamination), (*Contamination, Control), Aerosols, Alpha particles, Beta particles, Decontamination, Education, Electromagnetic radiation, Fluids, Gases, Industry, Infrared radiation, Laser radiation, Manuals, Mechanical vibrations, Microorganisms, Microwave radiation, Neutrons, Particles, Radioactivity, Radiowave radiation, Reagents, Solar radiation, Solvents, Sound waves, Surface air, Surface contamination, Surface waters, Thermal radiation, Ultraviolet radiation, Visible radiation

Identifiers: NTISAEC

GEPP-121 NTIS Prices: PC$11.25/MF$1.45

Quantitative Determination of the Structure--Property Relationships in Nuclear Fuel Element Materials. Quarterly Progress Report, January 1--March 31, 1973

Florida Univ., Gainesville. Engineering and Industrial Experiment Station. (3099000)
Rhines, F. N., DeHoff, R. T., Whitney, E. D.
A6161J1 Fld: 18J, 77I NSA2807
Jun 73 36p
Contract: AT(40-1)-4212
Monitor: 18

Abstract: For abstract, see NSA 28 07, number 16006.

Descriptors: (*Nickel, Powders), (*Powders, *Sample preparation), (*Uranium dioxide, *Mechanical properties), (*Nuclear fuels, Mechanical properties), Cold pressing, Control , Controlled atmospheres, Creep, Creep, Density, Design, Gases , Hot pressing, Hydrogen, Impurities, Laboratory equipment, Low pressure, Microscopy, Microstructure, Particle size, Physical properties, Porosity, Sintering, Surface properties, Thermal conductivity, Thermodynamic properties

Identifiers: AEC

ORO-4212-15 NTIS Prices: PC$4.00/MF$1.45

Heated Surface Jet Discharged Into a Flowing Ambient Stream

National Center for Research and Training in the Hydrologic and Hydraulic Aspects of Water Pollution Control, Nashville, Tenn.

Water pollution control research series
Motz, Louis H., Benedict, Barry A.
A5073H1 Fld: 8H, 13B, 64H, 68D GRAI7219
Mar 71 219p
Project: EPA-16130-FDQ
Monitor: EPA-16130-FDQ-03/71
Prepared in cooperation with Vanderbilt Univ., Nashville, Tenn.

Abstract: The temperature distribution in the water body due to a discharge of waste heat from a thermal-electrical plant is a function of the hydrodynamic variables of the discharge and the receiving water body. The temperature distribution can be described in terms of a surface jet discharging at some initial angle to the ambient flow and being deflected downstream by the momentum of the ambient velocity. It is assumed that in the vicinity of the surface jet, heat loss to the atmosphere is negligible. It is concluded that the application of the two dimensional surface jet model is dependent on the velocity ratio and the initial angle of discharge, and the value of the initial Richardson number, as low as 0.22. Both laboratory and field data are used for verification of the model which has been developed. Laboratory data were used to evaluate the two needed coefficients, a drag coefficient and an entrainment coefficient, as well as the length of the zone of flow establishment and the angle at the end of that zone.

Descriptors: (*Stream pollution, Mixing), (*Water pollution, Heat), (*Stream flow, Heat), Plumes, Jet mixing flow, Drag, Entrainment, Cooling water, Industrial wastes, Electric power plants, Stratification, Turbulent flow, Site surveys, Mathematical models, Hydraulic models

Identifiers: *Thermal pollution

PB-211 284 NTIS Prices: PC-GPO/MF$0.95-NTIS

Homing Devices

Defense Documentation Center Alexandria Va (107200)

Report bibliography Apr 54-Oct 71.
A4313F4 Fld: 17G, 76B GRAI7212
May 72 109p
Rept No: DDC-TAS-72-33

Abstract: The references cover use of homing devices in guided missiles, antitank projectiles, aircraft equipment, and parachute descents. Infrared detectors and sensors are discussed. Homing devices refer to radar homing, radio homing, heat homing, light homing, and proportional navigation. Also discussed are reliability, research and development, guidance and control systems, performance capabilities, and effectiveness of homing devices. (Author)

Descriptors: (*Homing devices, *Bibliographies), Radar homing, Light homing, Heat homing, Radio homing, Proportional navigation, Guided missiles(Air-to-air), Guided missiles(Surface-to-air), Aerial targets, Control systems, Sensors, Thermal targets, Optical tracking, Terminal guidance, Air-sea rescue beacons

AD-741 500 NTIS Prices: PC$3.00/MF$0.95

Industrial Waste Guide on Logging Practices

Federal Water Pollution Control Administration, Portland, Oreg. Northwest Region.
A4134F1 Fld: 13B, 11L, 68D, 71R, 52H GRAI7210
Feb 70 82p*
Monitor: FWPCA-13010-02/70
See also Rept. no. PB-197 262.

Abstract: Logging is an industrial activity which takes place in the commercial forest lands covering 40 percent of the land area of the Pacific Northwest. Logging can--and at many locations does--degrade the quality of water in the streams draining the forest lands. The report is dedicated to the logging practices which must be adopted by the logging industry if water quality is to be protected in the streams of the Pacific Northwest. An adequate tree harvesting plan includes maps, sketches, or pictures of the area to be harvested. Specifications are given for the building, use, and maintenance of a well-designed transportation system. Sections deal with logging roads, tree cutting, log yarding, buffer strips, watershed restoration, and municipal water supply watersheds. (Author)

Descriptors: (*Water pollution, *Industrial wastes), (*Lumbering, Water pollution), (*Surface water runoff, Water pollution), Water quality, Suspended sediments, Forest land, Heat, Erosion control, Roads, Vegetation, Clearing

Identifiers: *Water pollution control, Thermal pollution

PB-207 644 NTIS Prices: PC$3.00/MF$0.95

Assessment of Temperature Rise Suppression by Edge Losses during Irradiation

Naval Air Development Center Warminster Pa Crew Systems Dept (406610)

Summary rept.
Stoll, Alice M.
A3611E3 Fld: 6S, 57W GRAI7205
3 Dec 71 19p
Rept No: NADC-CS-7104
Project: ZR000-01-01-21

Abstract: A method to be utilized for human skin protection is described for determining: (1) the minimum aperture size required to yield temperature rise data free from edge loss effects in measurementss made at the center of a site during thermal irradiation of a semi-infinite solid; (2) the magnitude of edge losses due to restriction of the irradiated area to less than the 'no loss' size, and its variation with respect to irradiance level and exposure time; and (3) where the thermal properties of the material are known, the energy absorption rate. The latter, on comparison with the measured incident energy also yields a measure of the absorptivity of the materials.

Descriptors: (*Skin, Surface temperatures), (*Thermal radiation, Skin), Temperature control, Simulation, Thermal properties, Equations, Test methods, Effectiveness

Identifiers: Temperature rise

AD-735 881 NTIS Prices: PC$3.00 MF$0.95

Effects of Synergistic Environments on Hypersonic Interceptors and Re-Entry Vehicles

Auburn Univ Ala Dept of Mechanical Engineering (046870)

Final rept. 15 Mar-15 May 71
Elliott, Joel M., Vachon, Reginald I., Dyer, David F., Dunn, Jerry R., Goswami, Dahenra Y.
A258584 Fld: 16B, 15C, 18C, 75E, 74B, 77D GRAI7117
May 71 86p
Contract: DAAH01-69-C-1818

Abstract: The report summarizes efforts to predict synergistic environment effects on interceptors. A technical summary is presented that discusses the boundary layer analysis programs, the thermal radiation analysis, the shock/inviscid flow analysis, blast encounter analysis and mass injection analysis programs. Programming instructions and a sample problem are contained in the report. (Author)

Descriptors: (*Reentry vehicles, Blast), (*Antimissile defense systems, Guided missiles(Surface-to-air)), Interactions, Transport properties, Thermal radiation, Atmosphere entry, Flow fields, Angle of attack, Mathematical models, Punched cards, Control sequences, Programming(Computers)

Identifiers: Synergistic environments, *Synergism

AD-726 957 NTIS Prices: PC$3.00 MF$0.95

Degradation Mechanisms of Pigmented Coatings

Ohio State Univ Research Foundation Columbus (267360)

Final rept. 1 Dec 69-1 Jan 71
Campbell, William B., Cochran, Joe K.
A2472F2 Fld: 11C, 71E GRAI7116
Mar 71 70p*
Contract: F33615-70-C-1197
Project: AF-7342
Task: 734202
Monitor: AFML-TR-71-42-Pt-1

Abstract: Two different types of polydimethylsiloxane formuated with a rutile titanium dioxide pigment were evaluated as polymeric thermal control coatings. Oxygen permeability, diffusion, and solubility in these coatings were measured for various temperatures. It was noted that diffusion and permeability coefficients decreased as pigment concentration increased. Morphological investigations comparing surface roughness and surface area to the ultraviolet stability of a zinc orthotitanite coating indicated that pigment surface area is directly related to the increase in solar absorptance. (Author)

Descriptors: (*Paints, Degradation), (*Silicones, *Plastic paints), (*Plastic coatings, Permeability), Adsorption, Rutile , Permeability, Diffusion, Surfaces, Titanates, Zinc compounds , Oxygen, Ultraviolet radiation

Identifiers: Thermal control coatings, Zinc titanate, Poly(oxy-(silylene/dimethyl)), Desorption

AD-725 754 NTIS Prices: PC$3.00 MF$0.95

Process Techniques Study of Integrated Circuits Final Scientific Report

North American Rockwell Corp., Anaheim, Calif.
Brandewie, J. V., Scott, C. W.
A2432H2 Fld: 20L, 80N STAR0912
Jun 70 241p
Rept No: NASA-CR-117904
Contract: NAS12-4

Descriptors: *Failure analysis, *Integrated circuits, *Silicon oxides, *Trace contaminants, Crystal defects, Quality control, Surface properties, Thermal diffusion

Identifiers: NASA subject code 10

N71-23715 NTIS Prices: PC$3.00 MF$0.95

Chromatographic Test Facility. Analysis and Design of a Capsule Landing System and Surface Vehicle Control System for MARS Exploration

Rensselaer Polytechnic Inst., Troy, N. Y.
Baer, S. R., Benoit, G. L.
A2332J3 Fld: 14B, 73D STAR0911
Mar 71 42p
Rept No: NASA-CR-117468, RPI-TR-MP-19
Contract: NGL-33-018-091

Descriptors: *Aerospace engineering, *Gas chromatography, *Mars environment, *Mathematical models, *Test facilities, Atmospheric composition, Oscillographs, Thermal conductivity, Unmanned spacecraft

Identifiers: NASA subject code 14

N71-21931 NTIS Prices: PC$3.00 MF$0.95

OPTICAL MATERIALS STUDY PROGRAM

Perkin-Elmer Corp., Wilton, Conn. Optical Operations Div. (405 590)

Final technical rept. 21 Jan 69-20 Jan 70
Goggin, William R., Paquin, Roger A.
A1065J3 Fld: 20F, 80H USGRDR7023
Feb 70 92p
Rept No: OOD-Engineering-41
Contract: DAAH01-69-C-0950, ARPA Order-885
Distribution Limitation now Removed.

Abstract: Various materials are being investigated for use as diffraction limited mirror substrates. Included are dielectrics, such as fused silica, low expansion glasses and glass ceramics, and beryllium (BE) based materials. Material and processing specifications for BE optical components are developed and recommended. Sectioned BE mirrors were brazed and diffusion bonded and successfully polished and tested. Low reflectivity and very low scatter are reported for an anodized optically polished bare BE surface. Results of test programs of Precision Surface Interferometer are presented and discussed. The role of residual stress in thermal and temporal instabilities is presented. Data from Linear Dimensional Interferometer and Vacuum Dilatometer are presented. Details of brazing and diffusion bonding experiments for BE are included. (Author)

Descriptors: (*Mirrors, Manufacturing methods), (*Beryllium, Substrates), Precision finishing, Thermal stability, Stability, Acuity, Optical properties, Surfaces, Quality control, Dielectrics, Glass, Thermal expansion, Ceramic materials, Diffusion bonding, Optical coatings, Brazing, Reflectivity, Scattering, Anodic coatings, Interferometeres, Thermal stresses, Weight, Radiation damage, X-ray diffraction analysis, Sintering

Identifiers: Fused silica

AD-865 842 NTIS Prices: HC$3.00 MF$0.65

ULTRASONIC MEASUREMENTS ON CONCRETE SURFACES (Ultrazvukove Izmereniya v Betonnykh Pokrytiyakh)

Bureau of Reclamation, Denver, Colo. (068 900)
Pochtovik, G. Ya., Kashkin, S. K.
A0845K3 Fld: 14B, 13C, 73B, 60C USGRDR7020
Mar 65 13p
Rept No: Trans-536
Trans. of Avtomobilnye Dorogi (USSR) v25 n7 p13-14 1962, by Lola Hawkinberry.

Abstract: Nondestructive testing of concrete surfaces under construction or already in use is possible by using an improved ultrasonic impulse method. This method may be usec to control increased durability of concrete during construction, determine the actual durability of concrete at any place on the surface and compare it with control specimens, and determine and outline defective portions of pavements damaged by high temperatures generated by jet engines or by alternate freezing and thawing. The new methoc determines the velocity of longitudinal ultrasonic waves in a concrete slab and from this the durability of the concrete. (Author)

Descriptors: (*Pavements, Non-destructive testing), (*Ultrasonic radiation, Pulse systems), (*Runways, Non-destructive testing), Wave transmission, Thermal stresses, Test methods, Test equipment, Quality control, Mechanical properties, USSR

Identifiers: Translations

PB-193 641T NTIS Prices: HC$3.00 MF$0.65

MECHANISMS OF DEGRADATION OF POLYMERIC THERMAL CONTROL COATINGS. PART II: EFFECTS OF RADIATION ON SELECTED PIGMENTS

Gulf General Atomic Inc San Diego Calif (388247)

Final rept. 1 Sep 68-30 Nov 69
Firle, Tomas E., Flanagan, Terry M.
A0354C1 Fld: 11C, 7E, 71L, 71E USGRDR7014
Mar 70 113p
Rept No: GA-9853
Contract: F33615-69-C-1055
Project: AF-7342
Task: 734202
Monitor: AFML-TR-68-334-Pt-2
See also Part 1, AD-686 448. Prepared in cooperation with General Dynamics/Convair, San Diego, Calif. Space Sciences Lab

Abstract: An investigation has been conducted on the mechanisms of degradation of pigments and polymeric coatings for thermal control applications exposed to ultraviolet (uv) and electron irradiation. The materials investigated were rutile (titanium dioxide) and strontium titanate ($SrTiO_3$). The effects of treating the pigments by heating in various gas ambients at elevated temperatures were studied using gas chromatography and electrical conductivity measurements. Significant changes in the surface characteristics were found to result from these treatments. A comparison was made between the reflective degradation in binderless pigments and silicone-binder coatings exposed to uv light, to energetic electrons, and simultaneously to uv light and electrons. Evidence for stabilization of defect sites by charge capture was discovered in the binderless pigment experiments. This mechanism for defect stabilization does not appear as prevalent in the silicone-binder coatings, since the binder apparently passivates the pigment surface to some extent. The fluence dependence of the degradation and the recovery of the damage in vacuum and in the presence of various gas ambients was also studied. (Author)

Descriptors: (*Pigments, *Radiation damage), (*Degradation, Pigments), (*Coatings, Pigments), (*Silicones, Radiation damage), Temperature control, Rutile, Photolysis, Electron bombardment, Surface properties, Binders, Gas chromatography, Strontium compounds, Titanates

Identifiers: *Titanium dioxide, *Strontium titanates, Thermal control coatings

AD-706 127 CFSTI Prices: HC$3.00 MF$0.65

RADIANT COOLER DESIGN AND EMISSIVITY STUDY. PART 2 - EMISSIVITY STUDY FINAL REPORT, 8 APR. - 15 DEC. 1969

ITT Aerospace/Optical Div., Fort Wayne, Ind.
A0162G4 Fld: 13A, 916 STAR0808
15 Dec 69 37p
Rept No: NASA-CR-108772
Contract: NAS5-11683

Descriptors: *Radiant cooling, *Surface properties, *Thermal emission, Standard deviation, Temperature control

N70-20114 CFSTI Prices: HC$6.00 MF$0.95

PARAMETRIC STUDY OF THERMAL PROTECTION CONCEPTS FOR AIRBORNE RECORDED TAPES IN A SEVERE CRASH ENVIRONMENT

United Control, South El Monte, Calif. Data Div (405501)

Final rept.
Hulett, Richard B.
7245A3 Fld: 1B, 14C, 13L, 902, 941 USGRDR7006
Sep 69 102p*
Contract: FA-68-WA-1998
Project: FAA-530-003-08H
Monitor: FAA-DS-69-11
Errata sheet inserted.

Abstract: The purpose of the study is to investigate concepts and recommend practical means to lengthen the fire survival capability of airborne magnetic tape crash recorders. As directed, the time temperature profile is assumed to be 200 degrees F for 2 hours, decreasing to 500 degrees F in the next 6 hours and remaining at 500 degrees F for the next 16 hours for a total heat exposure of 24 hours. The study analytically investigates the internal recorder temperature for one, two and six sided heating. Off-the-shelf commercial insulations and some experimental insulations were reviewed and evaluated. (Author)

Descriptors: (*Aviation accidents, Records), (*Magnetic tape, Thermal insulation), (*Magnetic recording systems, Protection), Civil aviation, Armed forces operations, Surface temperatures, Heat sinks, Walls, Fire resistant materials, Programming(Computers), Costs, Reviews

Identifiers: *Flight recorders, Severe crash environments, Computer analysis

AD-699 899 CFSTI Prices: HC$6.00 MF$0.95

WATER EVAPORATION SUPPRESSION

Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
Gainer, John L., Beard, James Taylor, Thomas, Robert R.
7132K2 Fld: 13B, 7D, 903, 909 USGRDR7004
Aug 69 28p*
Rept No: Bull-27
Contract: DI-14-06-D-6385
Project: OWRR-A-019-VA

Abstract: The discovery that certain monolayer films applied to water surfaces can reduce evaporation has spurred investigation into their effectiveness in a water conservation program. Monolayers have been considered to act as diffusion barriers. A theory is presented which relates the diffusion of water through a liquid monolayer surface pressure. This theory should enable a quick evaluation of monolayer performance on outdoor bodies of water from a few simple measurements rather than by the more cumbersome energy budget technique. Two yellow monolayers were found: linoleic acid and 10-undecenoic acid. Although both were found to act as diffusion barriers, neither were found to improve the reflectivity of the water surface. A large number of yellow dyes were studied in an attempt to color a monolayer or to disperse the dye on the water surface with an evaporating solvent. In no instant did the dyes color the monolayer or form a monolayer themselves. A yellow silicone oil film on a water surface was studied after it was found experimentally to reflect solar energy about 1.7 times better than a plain water surface. Although it did not form a monolayer, it did effectively reduce the evaporation rate by diffusion. When spread over a water surface, the evaporation was reduced by 10%, and when spread over a linoleic acid monolayer, the evaporation was reduced by 15%. In addition, the film was found to be extremely difficult to remove from a water surface. This is a real advantage when one considerers the need to constantly resupply monolayers presently used in evaporation suppression applications. (Author)

Descriptors: (*Evaporation, *Monomolecular films), (*Water supplies, Monomolecular films), (*Silicones, Monomolecular films), (*Lakes, Evaporation), Dyes, Reflection, Diffusion, Surface properties, Surface-active substances, Linoleic acid, Fatty acids, Solar radiation

Identifiers: *Water conservation, Energy budget, *Evaporation control, Undecylenic acid, *Thermal pollution, Evaporation retarding films

PB-188 498 CFSTI Prices: HC$6.00 MF$0.95

STUDY OF IN SITU DEGRADATION OF THERMAL CONTROL SURFACES INTERIM REPORT, 7 MAR. 1967 - 7 SEP. 1968

IIT Research Inst., Chicago, Ill. Technology Center.
Gilligan, J. E., Zerlaut, G. A.
694413 Fld: 22B, 944 STAR0722
7 Mar 69 174p
Rept No: NASA-CR-102239, IITRI-U6061-17
Contract: NAS8-21074

Descriptors: *Spacecraft environments, *Surface properties, *Temperature control, Adsorption, Coatings, Infrared radiation, Ultraviolet radiation

N69-37456 CFSTI Prices: HC$6.00 MF$0.95

DETERMINATION OF THE INTERNAL THERMAL STATE FOR STEEL INGOTS BY MEANS OF MECHANICAL VIBRATION

Consiglio Nazionale Delle Ricerche, Rome (Italy). Istituto Nazionale Di Ultracustica O. M. Corbino.

Determinazione Dello Stato Termico Interno Dei Lingotti Di Acciaio Mediante Vibrazioni Meccaniche
Delia, S. , Mirabile, M.
6383K4 Fld: 11F, 924 STAR0714
Dec 67 29p
Rept No: INUA-3
Lang- in Italian

Descriptors: *Oscillators, *Steels, *Temperature distribution, *Thermodynamic properties, Automatic frequency control, Cylindrical bodies, Elastic properties, Electrodes, Ingots, Laminar heat transfer, Metal working, Surface temperature, Thermal stresses

N69-26481 CFSTI Prices: HC$6.00 MF$0.95

A SELF-CALIBRATING RADIOMETER FOR THE MEASUREMENT OF THERMAL RADIATION MICROWAVES OF THE EARTH'S SURFACE FROM AN AIRCRAFT

Technische Hochschule Munchen (West Germany). Fakultaet Fuer Maschinenwesen Und Elektrotechnik.

Ein Selbsteichendes Radiometer Zur Messung Der Thermischen Mikrowellenstrahlung des Erdbodens Vom Flugzeug Aus
Hach, J.-P.
6264F3 Fld: 14B, 945 STAR0712
1968 30p
Lang- in German

Descriptors: *Airborne equipment, *Earth surface, *Microwave radiometers, *Self adaptive control systems, *Thermal radiation, Feedback control, Planetary radiation, Surface temperature, Temperature measurement

N69-23741 CFSTI Prices: HC$6.00 MF$0.95

THE THERMAL RESPONSE OF HEAT-SINK REENTRY VEHICLES

Polytechnic Inst of Brooklyn N Y Dept of Aerospace Engineering and Applied Mechanics (286060)
Crisp, John D. C., Feitis, Peter
6041G4 Fld: 22C USGRDR6912
Jul 60 38p
Rept No: PIBAL-576
Contract: DA-30-069-ORD-2639

Abstract: In a performance comparison of reentry vehicles there are a number of important interrelated criteria determining the acceptability of the vehicle. These include the peak deceleration, the limits imposed by atmospheric heating, guidance control and accuracy, and time of descent. A general study has been undertaken which places emphasis on the first two considerations and is based on three vehicle configurations appropriate to both manned and unmanned entry into the earth's atmosphere from high supercircular speeds. The first vehicle type, designated 'sphere' is a high drag, nonlifting body. The second, referred to below as the 'body' type, is of moderate drag and possesses a trimming lift capability; while the third, the 'wing', simulates low-drag, high lift vehicles. For each configurational type heat transfer behavior is to be assessed on the basis of three techniques of heat dissipation, viz., by radiation alone, by ablation or internal cooling, and by the utilization of the vehicle as a heat sink. In this paper are presented the results of the heat sink studies in the form of thermal-time response and specifically in terms of temperature-time histories and peak temperatures as a function of vehicle mass, shape and aerodynamic parameters, entry orbit. The thermal response is correlated to peak deceleration. (Author)

Descriptors: (*Reentry vehicles, *Atmosphere entry), Lifting reentry vehicles, Spheres, Wings, Aerodynamic control surfaces, Heat transfer, Heat sinks, Aerodynamic heating, Ablation, Thermal analysis

AD-686 330 CFSTI Prices: PC$6.00 MF$0.95

VISCOUS AND THERMAL BOUNDARY LAYERS IN INCOMPRESSIBLE STEADY FLOWS ALONG LONGITUDINALLY CURVED SURFACES INCLUDING BOUNDARY LAYER CONTROL

Technische Hochschule Aachen (West Germany) Institut Fuer Mechanik (400005)

Annual summary rept. no. 8, 15 Nov 67-14 Nov 68
Schultz-Grunow, F., Henseler, H. J.
5955H2 Fld: 20D, 1A, 1C USGRDR6911
1968 36p
Contract: F61052-68-C-0023
Project: AF-7071
Monitor: ARL-68-0222

Abstract: Self similar solutions for the viscous and thermal boundary layer are deduced in second order approximation for flows along longitudinally curved surfaces without or with boundary layer control. The solutions cover surfaces the curvature K of which is proportional to a power of the arc length x. To this family of surfaces also belong the stagnation point flow at a cylinder and the wedge flows with curved flanks of the wedge. The apex of the wedge is correlated to the curvature dependence on the arc length. The main problems of the work are the derivation of optimal coordinates which render a solution for the whole boundary layer and to set up a main flow being a potential flow in the framework of the approximation. Numerical solutions are deduced by applying the Runge Kutta method. (Author)

Descriptors: (*Incompressible flow, Curved profiles), Thermodynamics, Boundary layer, Viscosity, Boundary layer control, Numerical methods and procedures, Stagnation point, Cylindrical bodies, Wedges, West Germany

AD-685 247 CFSTI Prices: PC$6.00 MF$0.95

THE EFFECTIVENESS OF DARKENING SURFACE AND INSULATING BRIDGE SLABS TO REDUCE UNEQUAL ICING

Alabama State Highway Dept., Montgomery.
Holman, F. L.
5633J3 Fld: 13M, 13B USGRDR6906
Jul 68 90p
Rept No: HPR-39
Prepared in cooperation with the Bureau of Public Roads, Washington, D. C.

Abstract: A research study was conducted to determine the effectiveness of reducing the frequency and rapidity of icing of bridge decks by insulating the underside of the bridge deck with urethane foam, by rise of a very dark material as a surface treatment, or both. The site selected was in the coldest region of Alabama. After two winters of evaluation of the treated and untreated bridge deck sections compared to adjoining bituminous and concrete pavements, it was determined that the foam insulation and dark surfacing combined performed most nearly like the control pavements in both freezing and thawing foam insulation alone was unsatisfactory in thawing. It was concluded that no treatment of the test bridge deck was entirely successful in equalizing the potential icing of bridge deck and roadway pavement, and that the use of foam insulation and/or dark surfacing is not justified in Alabama. (BPR Abstract)

Descriptors: (*Bridges, *Thermal insulation), Ice, Floors, Surface properties, Protective treatments, Control, Freezing, Effectiveness, Bituminous coatings, Concrete, Pavements, Alabama, Isocyanate plastics, Expanded plastics

Identifiers: Dark surfaces

PB-182 107 CFSTI Prices: PC$6.00 MF$0.95

HUMIDIFIED BUILDINGS

National Research Council of Canada Ottawa (Ontario) Div of Building Research (243950)

Canadian building digest
Hutcheon, N. B.
5173E3 Fld: 13M, 4B USGRDR6823
Jun 63 4p
Rept No: CBD-42

Abstract: The document covers principles and difficulties in the design of Canadian buildings as these relate to humidity.

Descriptors: (*Buildings, Humidity), (*Ceramic materials, Degradation), Construction, Canada, Brick, Rock(Geology), Walls, Climatology, Dew point, Temperature, Diffusion, Leakage(Fluid), Glass, Surface properties, Thermal conductivity, Design, Thermal insulation, Condensation, Surface area, Cracks

Identifiers: Masonry, Humidity control, Fin effect

AD-675 660 CFSTI Prices: PC$3.00 MF$0.95

OCEAN DATA STATION SENSOR SYSTEM DESCRIPTION EXPLORATORY DEPLOYMENT CONFIGURATIONS

General Dynamics/Convair San Diego Calif (147650)
Berquist, David L.
5065K4 Fld: 8J, 13J USGRDR6821
Jun 68 121p
Rept No: GDC-AAX68-003
Contract: Nonr-3062(00)
Project: NR-083-147

Abstract: The primary scientific function of Buoys ALPHA and BRAVO during the North Pacific Exploratory Deployment will be to gather meteorological and oceanographic data. The meteorological data requirements for this experiment are wind velocity, ambient air temperature and absolute moisture content at 5, 10 and 15 meters above sea level, as well as rainfall, radiation and barometric pressure. Oceanographic data requirements include surface roughness, current velocity, and seawater surface temperature. Underwater measurements of temperature, depth and conductivity will be made at ten positions along the mooring line to a depth of 500 meters. (Author)

Descriptors: (*Oceanographic data, Pacific Ocean), Meteorological parameters, Wind, Velocity, Mooring buoys, Oceanographic equipment, Performance(Engineering), Sea water, Thermal conductivity, Ocean currents, Sensors, Roughness, Telemeter systems, Surface temperatures, Ocean bottom sampling, Pacific Ocean

Identifiers: *DACS(Data Aquisition and Control System), *Data aquisition and control systems, North Pacific exploratory deployment, Alpha buoy, Bravo buoy

AD-674 410 CFSTI Prices: PC$6.00 MF$0.95

LARGE-SCALE WALL HEAT-FLOW MEASURING APPARATUS

National Research Council of Canada Ottawa (Ontario) Div of Building Research (243950)

Research paper
Solvason, K. R.
5064G4 Fld: 20M USGRDR6821
1959 12p
Rept No: RP-101
Monitor: NRC-5421
Availability: Pub. in American Society of Heating, Refrigerating and Air Conditioning Engineers Transactions, v65 p541-550 1959. No copies furnished.

Abstract: A recently completed construction is an apparatus to measure steady-state and periodic heat flow through 8-ft square wall sections. The apparatus consists of two 8- by 8- by 4-ft boxes open on one side, between which the test wall is placed. One box is maintained at the desired constant cold side temperature from -35F to +50F for steady-state tests or varied according to some predetermined cycle for periodic heat flow tests. The other box is electrically heated to maintain a constant warm side temperature of from 65F to 75F. The heat transmission coefficient for the wall specimen is calculated from the measured electrical input and temperatures. (Author)

Descriptors: (*Heat transfer, Walls), Heat flux, Surface temperatures, Temperature control, Flowmeters, Instrumentation, Test methods, Test facilities, Thermal conductivity, Numerical methods and procedures, Canada

AD-674 346

THE IN-ORBIT THERMAL PERFORMANCE OF THE ARIEL 3 SPACECRAFT. PART 1 - MAY - SEPTEMBER 1967

Royal Aircraft Establishment, Farnborough (England).
Semple, E. C.
5031L4 Fld: 22B STAR0618
Oct 67 19p
Rept No: RAE-TR-67253

Descriptors: *Ariel satellites, *Control surfaces, *Thermal insulation, Data correlation, Gold coatings, Operating temperature, Performance prediction, Protective coatings, Skin temperature (non-biological), Surface temperature, Temperature measurement, Thermal absorption

N68-29645 CFSTI Prices: PC$3.00 MF$0.95

ROCKET IR HORIZON DATA

American Science and Engineering Inc Cambridge Mass (026500)

Final rept. 15 May 66-15 Mar 68
Sodickson, Lester A., Becker, Robert L.
4953D1 Fld. 17E, 4A, 19G USGRDR6819
21 Jun 68 56p
Rept No: ASE-1950
Contract: AF 19(628)-5964
Project: AF-7670
Task: 767007
Monitor: AFCRL-68-0300

Abstract: 7 - 30 micron emission spectra of the earth and atmosphere near the geometric horizon have been obtained with a rocket-borne telescope/interferometer. The CO2 (15 micron) and the ozone (9.7 micron) bands are observed in absorption when viewing the earth. The CO2 band is also seen in emission when the field-of-view grazes the earth. (Author)

Descriptors: (*Infrared radiation, Upper atmosphere), (*Sounding rockets, Infrared radiation), Measurement, Thermal radiation, Emissivity, Electrons, Telescopes, Interferometers, Moon, Surface properties, Fourier analysis, Carbon dioxide, Ozone, Absorption spectrum, Infrared equipment

Identifiers: Closed-loop control systems, Interferograms, Aerobee, Lunar emission

AD-672 991 CFSTI Prices: PC$6.00 MF$0.95

INSTRUMENTED PROBES FOR DEEP GLACIAL INVESTIGATIONS

Cold Regions Research and Engineering Lab Hanover N H (037100)

Technical rept.
Aamot, Haldor W. C.
4883C2 Fld: 8L, 14B USGRDR6818
May 68 14p
Rept No: CRREL-TR-210
Project: DA-1T013001A91A

Abstract: Thermal probes have been developed that can carry instrumentation packages into polar ice sheets for geophysical investigations and long-term observations by remote measurement. They are self-contained, surface-controlled devices During development work at USA CRREL problems with materials, fabrication, and heat transfer analysis were solved. The Philberth probe, named after its inventor, demonstrated its performance capability in Greenland. The pendulum probe was a further development with increased performance and versatility. (Author)

Descriptors: (*Glaciers, Probes), Ice, Penetration, Instrumentation, Geophysics, Performance(Engineering), Surface properties, Thermal properties, Heat transfer, Manufacturing methods, Efficiency, Control systems, Automatic, Ice islands, Polar regions, Greenland

Identifiers: *Thermal probes

AD-672 057 CFSTI Prices: PC$3.00 MF$0.95

DESIGN CONCEPTS FOR MINIMUM WEIGHT, HIGH PERFORMANCE SUPERSONIC AIRCRAFT STRUCTURES

Douglas Aircraft Co., Inc., Long Beach, Calif. (116 400)

Summary rept. 1 Apr 62-1 Apr 63
473513 Fld: 1C USGRDR6815
1 Apr 63 231p
Rept No: DAC-31237
Contract: AF 33(657)-8541
Project: AF-9056

Abstract: Research investigations accomplished on MACH 3 supersonic transport structural concepts are reported. Structural design criteria are established, and stainless steel and titanium materials are investigated. Promising wing, fuselage, and control surface structural concepts are selected, and structural analyses procedures and design charts are developed. Thermal analyses including modifications to a computer program are described. Panel and joint specimen designs are described, and status of their manufacture and testing is reported. The designs and manufacturing status of wing box and fuselage cabin wall test specimens are presented along with plans for their structural and thermal tests. Investigation of variable sweep wing structures including redundant force analyses of the large diameter bearing pivot concept is reported. (Author)

Descriptors: (*Supersonic planes, Design), (*Airframes, Supersonic planes), Structures, Jet transport planes, Weight, Stainless steel, Titanium alloys, Wings, Fuselages, Control surfaces, Thermal stresses, Programming(Computers), Airplane panels, Manufacturing methods, Variable-sweep wings, Force(Mechanics), Research program administration

Identifiers: FORTRAN

AD-456 900 CFSTI Price: PC$6.00

EVALUATION OF REWRAPPED SOLDERLESS WRAPPED CONNECTIONS

Naval Avionics Facility Indianapolis Ind (247950)

Technical rept.
Coy, Richard I.
4713L1 Fld: 9A, 13J, 19E USGRDR6815
9 Oct 67 22p
Rept No: NAFI-TR-1092
Project. TA-38402

Abstract: A typical one-row, 0.20 inch centers, Polaris MK 84 Fire Control Type 2 Module (hereinafter referred to as the Testplate) wired with No. 18 AWG and No. 24 AWG wire and numerous individual wrapped connections wrapped with No. 18 AWG and No. 24 AWG wire were used during the evaluation. The Testplate was subjected to Visual Examination, Wrapper Resistance, Thermal Shock, Salt Spray, Vibration, and Current Overload Tests in accordance with Specification OS-11120. The individual wraposts were subjected to Visual Examination, Wrapper Resistance, Wrapper Stripping, Unwrapping, and Gas Tight Area Tests in accordance with Specification OS-11120. The wrapped connections, including those on the Testplate, consisted of wraposts containing the initial wrap, wraposts that had been rewrapped 10 times, and wraposts that had been rewrapped 25 times. (Author)

Descriptors: (*Guided missiles(Underwater-to-surface), Fire control systems), (*Electric connectors, Winding), Wire-winding machines, Beryllium alloys, Copper alloys, Plating, Silver, Gold, Electric wire, Electric insulation, Visual inspection, Leakage(Fluid), Resistance(Electrical), Force(Mechanics), Thermal shock, Salt spray tests, Vibration, Naval research, Specifications, Military publications

Identifiers: Polaris, Wraposts

AD-669 984 CFSTI Prices: PC$6.00 MF$0.95

SOLAR HEATING OF VARIOUS SURFACES

National Bureau of Standards, Washington, D. C. (240 800)

Building Materials and Structures rept.
Cottony, Herman V., Dill, Richard S.
4675H1 Fld: 20M, 11C USGRDR6814
23 Jan 41 12p
Rept No: BMS-64

Abstract: Methods of improving comfort conditions in homes during warm weather were investigated in connection with the low-cost housing program at the National Bureau of Standards, and this report presents one phase of this subject. During this study, the temperatures attained by various surfaces exposed to the sun and weather, as if upon a roof, were observed. Heating by sunlight and cooling by radiation to the sky at night of several paints and commonly usec roof coverings can be compared directly by means of the results obtained.

Descriptors: (*Finishes + finishing, *Thermal radiation), Roofs, Paints, Solar radiation, Solar collectors, Temperature control, Test methods, Thermal properties, Surface temperatures

Identifiers: Protective coatings

PB-177 986 CFSTI Prices: PC$3.00 MF$0.95

DEVELOPMENT OF A SEMIACTIVE TEMPERATURE CONTROL SYSTEM

Bundesministerium Fuer Wissenschaftliche Forschung, Bad Godesberg (West Germany).

Entwicklungsarbeiten An Einem Halbaktiven Temperatur-regelsys-tem
Bey, R. , Hermann, E. , Kalkbrenner, B.
4642H3 Fld: 22B STAR0611
Oct 67 60p
Rept No: BMWF-FB-W-67-32
Lang- in German, English Summary

Descriptors: *Satellite design, *Surface temperature, *Temperature control, Cooling systems, Heat shielding, Spacecraft shielding, Temperature distribution, Temperature sensors, Thermal insulation

N68-21152 CFSTI Prices: PC$6.00 MF$0.95

LITERATURE REVIEW OF MECHANISMS OF INTERACTION OF ETHYLENE OXIDE AND ORGANIC AND INORGANIC MATERIALS

Hughes Aircraft Co., Culver City, Calif. Aerospace Group.
Landis, A. L.
346414 Fld: 7C, 7D STAR0513
Nov 64 7p
Rept No: NASA-CR-83816, REPT.-2748.401878
Contract: NAS7-100, JPL-951003
Monitor: 18
Prepared for Jpl

Descriptors: *Ethylene oxide, *Inorganic compound, *Polymer, Chemical, Compound, Condensation, Contact, Control, Electric, Ethylene, Inorganic, Organic, Oxide, Polymerization, Property, Salt, Surface, Thermal, Volatility

N67-25674 CFSTI Prices: PC$3.00 MF$0.95

HEAT TRANSFER ACROSS SURFACES IN CONTACT - PRACTICAL EFFECTS OF TRANSIENT TEMPERATURE AND PRESSURE ENVIRONMENTS SEMIANNUAL REPORT, 1 APR. - 1 OCT. 1966

Southern Methodist Univ., Dallas, Tex.
Blum, H. A.
3203F1 Fld: 20M STAR0508
1 Oct 66 15p
Rept No: NASA-CR-82396
Grant: NSG-711
Monitor: 18

Descriptors: *Heat transfer, *Temperature effect, *Transient pressure, Conductivity, Contact, Control, Device, Dimensional, Distribution, Effect, Metal, One, Prediction, Pressure, State, Steady, Surface, Temperature, Thermal, Thermodynamics, Transient, Two

N67-18979 CFSTI Prices: PC$3.00 MF$0.95

DIRECTIONAL CHARACTERISTICS OF LUNAR THERMAL EMISSION

Brown Engineering Co Inc Huntsville Ala Research Labs (065210)

Technical note
Montgomery, C. G., Six, N. F. Jr, Saari, J. M., Shorthill, R. W.
3102G1 Fld: 3B, 22A USGRDR6708
Nov 66 96p
Rept No: TN-R-213
Contract: NAS8-20166
Monitor: 18
Prepared in cooperation with Boeing Scientific Research Labs., Seattle, Wash., Geo-Astrophysics Lab., Rept. no. D1-82-0568.

Abstract: Preliminary studies of the directional characteristics of lunar thermal emission have been completed using existing infrared lunation data. Brightness temperatures were obtained at every 10C interval of a thermal latitude and longitude grid system where the subsolar point was defined as the thermal north pole, the antisolar point as the thermal south pole, and the thermal prime meridian as passing through the apparent disk center. The results are presented in the form of a family of plots of brightness temperature versus thermal coordinates. Comparisons with the Lambert diffuse surface law are made. (Author)

Descriptors: (*Moon, *Thermal radiation), (*Infrared radiation, Moon), Lunar environment, Surface properties, Roughness, Emissivity, Brightness, Temperature, Terrain, Reflectivity, Infrared scanning, Lunar craft, Temperature control

AD-647 179 CFSTI Prices: PC$6.00 MF$0.95

BASIC STUDIES ON THE USE AND CONTROL OF SOLAR ENERGY

California Univ., Los Angeles. Dept. of Engineering. (072 260)

Annual rept., Aug 59-Aug 60
Edwards, D K., Nelson, K. E., Roddick, R. D., Gier, J. T.
3021E4 Fld: 20M, 22B USGRDR6702
Oct 60 235p
Rept No: 60-93
Grant: NSF-G-9505
Monitor: 18

Abstract: Nomenclature and concepts of thermal radiation characteristics which are used in applications involving solar energy are reviewed. Fundamental characteristics are shown to be the spectral reflection and transmission distribution functions. Directional, hemispherical, and total characteristics are expressed in terms of the distribution functions. The use of these functions together with the reciprocity relation for the expression of the quantities measured in heated cavity and integrating sphere reflectometers clarifies the operation of these instruments.

Descriptors: (*Solar radiation, Instrumentation), (*Spacecraft, Solar radiation), Thermal radiation, Intensity, Surfaces, Temperature control, Reflection, Wave transmission, Distribution functions, Reflectometers

PB-173 633 CFSTI Prices: PC$6.00 MF$0.95

THE GROWTH OF A DEPOSITED LAYER ON A COLD SURFACE

Polytechnic Inst of Brooklyn N Y Dept of Aerospace Engineering and Applied Mechanics (000000)

Revised ed.
Libby, Paul A., Chen, Shun
1925B4 USGRDR6516
19 Oct 64 2p
Contract: AF33 657 8286
Monitor: ARL-65-158
Pub. in Heat and Mass Transfer v8 p395-402 1965 (Copies available only to DDC users). Revision of manuscript submitted 24 Jul 64.

Abstract: An approximate analysis of the growth of, and the temperature within, a deposit which may occur in a cold surface in a gas stream is developed with the convective heat transfer to the surface of the deposit taken into account. Simple 'short time' and 'long time' solutions are obtained. A numerical example which may be of interest in connection with cryogenic surfaces in a hypersonic wind tunnel is presented. (Author)

Descriptors: (*Condensation, Gas flow), (*Cryogenics, Condensation), (*Gas flow, Condensation), (*Heat transfer, Condensation), Thermal conductivity, Phase studies, Laminates, Surfaces, Boundary layer control, Supersonic wind tunnels, Geophysics, Compressors

AD-617 875

TEMPERATURE OF THE HUMAN BODY DURING RAPID ALTERNATE HEATING AND COOLING

Institute of Occupational Health Helsinki (Finland) Dept of Physiology (000000)

Final rept. for May 63-Apr 64
Piironen, Pekka, Aikas, Erkki
1754L2 USGRDR
Dec 64 2p
Contract: AF EOAR63 113
Project: 7164
Task: 716409
Monitor: AMRL-TR64 131

Abstract: Eight nude resting male subjects were immersed in water. The temperature of the bath was varied cyclically from -5 to 42C. Similar experiments were performed in air with temperatures varying from -5 to 120C. Skin temperatures oscillated sinusoidally with amplitudes varying from 1 to 10C and periods varying from 3.75 to 30 minutes. Variations in skin temperature below 30C did not affect the oesophageal temperature. Sinusoidal variations in skin temperature above 34C were reflected in nearly sinusoidal alterations in the oesophageal temperature. Sinusoidal variations in oesophageal temperature were accompanied by nearly sinusoidal alterations in rectal, sublingual and tympanic membrane temperatures, with damping characteristics and phase shifts typical for each site of measurement. (Author)

Descriptors: (*BODY, TEMPERATURE CONTROL), (*BODY TEMPERATURE, STRESS (PHYSIOLOGY)), COOLING, HEATING, HEAT TRANSFER, THERMAL STRESSES, SURFACE TEMPERATURE, HEAT TOLERANCE, TOLERANCES (PHYSIOLOGY), ENVIRONMENTAL TESTS

AD-611 805 CFSTI Price: PC$3.00

STUDY OF THE EFFECT OF JPL STERILIZATION TECHNIQUES ON THERMAL CONTROL SURFACES

Hughes Aircraft Co., Culver City, Calif. Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Blair, P. M. Jr
0882C4 Fld: 13H STAR0408
15 Dec 65 25p
Rept No: NASA-CR-70838, P65-173
Contract: NAS7-100
Prepared for Jpl

Descriptors: *Control surface, *Metal surface, *Paint, *Sterilization, *Temperature control, Absorption, Color, Control, Effect, Emission, Ethylene, Heat, Metal, Oxide, Procedure, Solar, Surface, Temperature, Thermal

N66-18443 CFSTI Prices: PC$6.00 MF$0.95

CERAMICS FOR NEW WEAPONS

Watertown Arsenal Labs., Mass. (370 850)
Levitt, Albert P.,
023212 Fld: 11B, 16C USGRDR4017
Jun 61 7p
Rept No: MS-35
Available copy will not permit fully legible reproduction.

Descriptors: (*Weapon systems, Ceramic materials), (*Ceramic materials, High-temperature research), Reviews, Thermal properties, Emissivity, Mechanical properties, Cermets, Composite materials, Ceramic coatings, Rocket motor nozzles, Nozzle inserts, Control surfaces, Radomes, Nose cones, Graphite, Coatings

AD-455 324 CFSTI Prices: PC$1.00

User1277 Date:15aug77 Time: 7:41:53 File: 6

Set	Items	Description
1	36835	TEMPERATURE?
2	20409	THERMAL
3	43427	RADIAT?
4	23255	HEAT
5	101441	1-4/OR
6	26363	SURFACE?
7	6942	COATING?
8	936	PAINT?
9	32662	6-8/OR
10	52391	CONTROL?
11	731	5*9*10
12	48992	SPACE
13	4290	VACUUM
14	52353	12+13
15	264	11*14
16	17881	VEHICLE?
17	33	15*16
18	231	15-17
19	4531	CONTAMINA?
20	2733	DEGRAD?
21	752	SPUTTER?
22	7931	19-21/OR

Print 17/5/1-33
Print 18/5/1-231

Search Time: 0.111 Prints: 264 Descs.: 7

Structural Design Concepts for Variable-Geometry Lifting Surfaces of Reentry Vehicles

Space and Information Systems Div North American Aviation Inc Downey Calif (328 360)

Final rept. May 65-Oct 66
Gordy, Nelson G., Wright, Robert M. Jr, Price, M. A.
D2185F2 Fld: 22B, 20D, 13M d7712
Oct 66 296p
Rept No: SID-66-1388
Contract: AF 33(615)-2685
Project: AF-1368
Task: 136808
Monitor: AFFDL-TR-66-175
Distribution limitation now removed.

Abstract: An investigation and theoretical analysis was conducted to determine structural design concepts for variable geometry lifting surfaces for improving low speed performance and maneuverability of re-entry vehicles. Various lifting surface concepts were considered for three representative vehicles. These vehicles were the M22-f, SORTIE, and SID-1. The lifting surface concepts considered for these vehicles were evaluated and based on aerothermal and structural considerations, the concept most applicable to each vehicle was selected for further analysis and design. As a result of the detailed study of the three selected configurations, weight and volume penalties associated with the application of variable geometry to the re-entry vehicles were determined. (Author)

Descriptors: (*Boost glide vehicles, Structural properties), (*Reentry vehicles, Design), Wing body configurations, Geometric forms, Lift, Structures, Theory, Aerodynamic configurations, Surface properties, Landing, Drag, Weight, Volume, Load distribution, Mathematical analysis, Thermodynamics, Gust loads, Fuselages, Wings, Aerodynamic loading, Aerodynamic control surfaces, Aeroelasticity, Thermal stresses, Maneuverability, Performance(Engineering)

Identifiers: Lift-drag ratio, NTISDODXD

AD-801 963/0ST NTIS Prices: PC$9.25/MF$3.00

Reservoir Finish Study for Hydraulic System, Model 55, Centaur

General Dynamics/Astronautics San Diego Calif (147 550)
Saunders, R.
D1431F4 Fld: 13G, 11G, 22D d7707
1959 7p
Rept No: GDA-AZM-55-012
Monitor: 18
Distribution limitation now removed.

Abstract: The purpose of this study is to determine a method of coating the external surfaces of the Model 55 Hydraulic System, which will be compatible with the low emissivity values. Any surface coating which is applied to the system must be capable of withstanding these environmental and temperature conditions without peeling or flaking. Another area to be considered is the internal surfaces of the Hydraulic Tank Assy. (Part 55-85301). Since this unit incorporates a number of moving pistons and 'O' Ring Seals, it will, therefore, be necessary to provide a hard wearable surface on the internal cylinder walls of these units. (Author)

Descriptors: (*Launch vehicles, Hydraulic equipment), (*Hydraulic equipment, *Heat resistant materials), Surface area, Coatings, Space environments, Emissivity, Combustion chamber liners, Anodic coatings, Chromizing, Electroless plating, Aluminum coatings, Antiradar coatings, Tape wound construction, Polishes, Reliability, Quality control, Wear resistance, Environmental tests

Identifiers: Centaur, NTISDODXD

AD-832 488/1ST NTIS Prices: PC$3.50/MF$3.00

Environmental Charging of Spacecraft Surfaces: Tests of Thermal Control Materials for Use on the Global Positioning System Flight Space Vehicle. Part 1: Specimens 1 to 5

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Stevens, N. J., Klinect, V. W., Berkopec, F. D.
D0082E4 Fld: 11C, 13A, 22B, 71E, 84C, 84G STAR1421
Jul 76 , 42p
Rept No: NASA-TM-X-73467, E-8836
Monitor: 18

Abstract: The NASA/USAF program on Environmental Charging of Spacecraft Surfaces consists of experimental efforts directed toward evaluating the response of materials to the environmental charged particle flux. Samples of thermal blankets and second surface mirrors of the type to be used on the Global Positioning System Flight Space Vehicle were tested to determine their response to electron flux. The primary result observed was that the ground connection of the metal layers of the blanket, as made by the baseline grounding technique using serrated washers and grommets, deteriorated with time at test. The discharges observed on the blankets were the glow type, not the 'lightning' strike observed on past specimens. Testing was performed at ambient laboratory temperatures. (Author)

Descriptors: *Spacecraft, *Thermal control coatings, Electrostatic charge, Spacecraft orbits, Aerospace environments, Charged particles, Electric discharges

Identifiers: Heat shielding, Environmental tests, NTISNASA

N76-30445/0ST NTIS Prices: PC$4.00/MF$3.00

Environmental Charging of Spacecraft-Tests of Thermal Control Materials for Use on the Global Positioning System Flight Space Vehicle. Part 2: Specimen 6 to 9

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Stevens, N. J., Berkopec, F. D., Blech, R. A.
C7415J4 Fld: 22A, 22B, 84A, 84C STAR1417
Jun 76 44p
Rept No: NASA-TM-X-73436, E-8789
Monitor: 18

Abstract: The NASA/USAF program on Environmental Charging of Spacecraft Surface consists, in part, of experimental efforts directed toward evaluating the response of materials to the environmental charged particle flux. Samples of thermal blankets of the type to be used on the Global Positioning System Flight Space Vehicles were tested to determine their response to electron flux. The primary result observed was that no discharges were obtained with the quartz-fiber-fabric-covered multilayer insulation specimen. The taped aluminized polyester grounding system used on all specimens did not appear to grossly deteriorate with time; however, the specimens require specific external pressure to maintain constant grounding system resistance. (Author)

Descriptors: *Charged particles, *Spacecraft construction materials, *Surface reactions, *Thermal control coatings, Dielectrics, Electrons, Flux (Rate), Multilayer insulation, Spacecraft design

Identifiers: NTISNASA

N76-26261/7ST NTIS Prices: PC$4.00/MF$3.00

Flexible Rolled-Up Solar Array

Hughes Aircraft CO El Segundo Calif Space and Communications Group (406 619)

Final technical rept. 1 Jul 68-31 May 72
Felkel, Edward O., Wolff, George
C7323K1 Fld: 10B, 22B d7622
30 Jun 72 324p
Rept No: SCG-72(41)-11244, HAC-Ref-B3532
Contract: F33615-68-C-1676
Project: AF-682J
Monitor: AFAPL-TR-72-61
Distribution limitation now removed.

Abstract: This report summarizes the design, development, qualification, and flight test of a 1.5-kw flexible rolled-up solar array power system. This system was launched on a thrust augmented Thor/Agena vehicle system into a 400 nm polar orbit on 17 October 1971, has successfully completed a 6 month flight test, and continues to provide spacecraft power. The criteria, design tradeoffs, and analyses that led to the configuration of the 5.5-by 32-foot solar array, the two axis sun acquisition and tracking orientation mechanism, and the associated power electronics and instrumentation units are described. The results of development, qualification, and flight test are presented, as well as recommendations for design improvements or developments for future similar applications. The recommendations include principal parameters and performance data such as array aspect ratios, weight, and natural frequency for systems ranging from 0.5 to 20 kw. The flight data illustrate the compatibility of the flexible solar array concept with flight systems. Power output has been excellent with no evidence of mechanical damage from boost, deployment, or operational environments. Peak power degradation has been reflective of the normal reaction of solar cells to the space environment. Spacecraft and array dynamic interactions have been minimal and vehicle integration has proven straightforward and effective. The report illustrates the viability of the 1.5kw flexible array design as a flight power system in its own right and also as a module of power systems to the 20-kw level. (Author)

Descriptors: (*Solar panels, Flexible structures), (*Solar cells, Solar panels), Mechanical properties, Electric power production, Power supplies, Satellites(Artificial), Sun, Tracking, Attitude control systems, Damage, Radiation effects, Deployment, Spacecraft components, Detectors, Launch vehicles, Orbits, Flight testing, Space environments, Surface to surface missiles

Identifiers: Agena, *Rolled up solar arrays, Thor, NTISDODXD

AD-902 099/1ST NTIS Prices: PC$9.75/MF$3.00

Development of Space-Stable Thermal Control Coatings for Use on Large Space Vehicles

IIT Research Inst., Chicago, Ill.

Final Report, 4 Jan. 1971 - 1 Nov. 1975.
Gilligan, J. E., Harada, Y.
C6973I3 Fld: 11C, 07D, 22B, 71E, 99F, 84G STAR1414
15 Mar 76 466p
Rept No: NASA-CR-144310, ITTRI-C6233-57
Contract: NAS8-26791, ITTRI PROJ. C6233
Monitor: 18

Abstract: The potential of zinc orthotitanate as a pigment for spacecraft thermal control was demonstrated. The properties and performance of pigments prepared by solid state, coprecipitation, and mixed oxalate methods were compared. Environmental tests and subsequent spectral analysis were given primary emphasis.

Descriptors: *Spacecraft shielding, *Thermal control coatings, *Pigments, Aerospace environments, Chemical reactions, Electron paramagnetic resonance, Environmental tests, Stoichiometry, Titanates, Zinc compounds

Identifiers: *Zinc titanates, Synthesis(Chemistry), NTISNASA

N76-23584/5ST NTIS Prices: PC$12.00/MF$2.25

Spaceflight Technology at NLR

National Aerospace Lab , Amsterdam (Netherlands).
C6744K1 Fld: 22D, 22B, 84E, 84F STAR1410
1975 11p
Monitor: 18

Abstract: The inertial guidance system testing facilities built for the ELDO Europa 2 launch vehicle are described. Strapdown inertial systems and double gimballed momentum wheels for attitude control of spacecraft were developed. Mission analysis studies for ESRO satellites were performed. The Astronomical Netherlands Satellite is controlled by an NLR operations team. Studies for ESRO Helos (Exosat) satellite experiments and ESRO SPACELAB user requirements were also performed.

Descriptors: *Astronomical netherlands satellite, *Europa 2 launch vehicle, *Exosat satellite, *Heat budget, *Inertial guidance, *Satellite attitude control, Automatic pilots, Data recording, Mission planning, Momentum, Mylar (Trademark), Space laboratories, Thermal control coatings, Wheels

Identifiers: Netherlands, NTISNASAE

N76-19221/0ST NTIS Prices: PC$3.50/MF$2.25

Passive Nosetip Technology (PANT) Program. Volume XIV. An Experimental Study to Evaluate the Irregular Nosetip Shape Regime - Data Report

Acurex Corp Mountain View Calif Aerotherm Div*Space and Missile Systems Organization, Los Angeles, Calif. (407435)

Interim rept. May 73-Dec 74
Nelson, E. V., Derbidge, T. C., Chan, D.
C6054J2 Fld: 16C, 20D, 71A, 46B, 75E, 75F GRAI7608
Apr 74 220p
Rept No: Aerotherm-74-100-Vol-14
Contract: F04701-71-C-0027
Monitor: SAMSO-TR-74-86-Vol-14
See also Volume 13, AD-A020 711 and Volume 15, AD-A020 713.

Abstract: Hypersonic wind tunnel tests conducted in the Naval Ordnance Laboratory Tunnel No. 8 are described. Thirty low temperature ablator (LTA) models were tested at Mach 5, with total temperatures between 493 deg F and 1013 deg F and free stream unit Reynolds numbers from 0.77 million to 15.70 million per ft. The Reynolds number regime for the formation of irregular shapes was found to be significantly influenced by nosetip size (nose radius) and wall temperature ratio (boundary layer edge to wall).

Descriptors: *Nose tips, *Ablation, *Hypersonic characteristics, Reentry vehicles, Wind tunnel tests, Model tests, Temperature control, Reynolds number, Surface temperature, Shape, Flow fields, Nonuniform flow, Change detection, Photographs, Configurations, Assessment

Identifiers: Shape change, PANT program, Unsteady flow, Evaluation, NTISDODAF

AD-A020 712/6ST NTIS Prices: PC$7.75/MF$2.25

Development of Space Stable Thermal Control Coatings for Use on Large Space Vehicles

IIT Research Inst., Chicago, Ill. Technology Center.

Triannual Report, 1 Sep. - 31 Dec. 1973.
Gilligan, J. E., Harada, Y.
C5754C4 Fld: 22B, 11C, 71E, 84C, 84G STAR1401
Mar 74 23p
Rept No: NASA-CR-143991, IITRI-C6233-36
Contract: NAS8-26791
Monitor: 18

Abstract: The development of a large scale manufacturing method for the production of a stable zinc orthotitanate pigment by means of an oxalate co-precipitation method is examined. Pigments were prepared at various temperatures, and major emphasis was placed on the determination of the important parameters of post-precipitation firing and treatment A large-scale process for the modification of a glass resin binder was developed and paints were formulated using the binder. (Author)

Descriptors: *Metal coatings, *Spacecraft structures, *Thermal control coatings, Binders (Materials), Environmental tests, Microstructure, Pigments, Reflectance, Solar radiation, Zinc compounds

Identifiers: NTISNASA

N76-10210/2ST NTIS Prices: PC$3.50/MF$2.25

Development of Space Stable Thermal Control Coatings for Use on Large Space Vehicles

IIT Research Inst., Chicago, Ill. Technology Center.

Triannual Report, 1 Jan. - 30 Apr. 1975.
Harada, Y., Gilligan, J. E.
C5185F4 Fld: 11C, 71E, 84C, 84G STAR1317
Jun 75 34p
Rept No: NASA-CR-143879, IITRI-C6233-52
Contract: NAS8-26791
Monitor: 18

Abstract: Pigment manufacturing development, binder development, environmental effects evaluations, and general coatings investigations are discussed. The relative emphasis on each of these tasks varied according to the urgency of the problems elucidated and the availability of time and funds. Emphasis is placed on the development of a mixed oxalate precursor zinc orthotitanate pigment manufacturing method and related studies and on complementary environmental testing and evaluation activities. (Author)

Descriptors: *Heat shielding, *Spacecraft shielding, *Thermal control coatings, Environment effects, Oxalates, Pigments, Solar reflectors, Titanium compounds, Zinc compounds

Identifiers: NTISNASA

N75-26139/6ST NTIS Prices: PC$3.75/MF$2.25

Development of Space Stable Thermal Control Coatings for Use on Large Space Vehicles

IIT Research Inst., Chicago, Ill. Technology Center.

Triannual Report, 1 Sep.-31 Dec. 1974.
Gilligan, J. E., Harada, Y.
C5121D2 Fld: 11C, 71E, 84C STAR1316
Feb 75 87p
Rept No: NASA-CR-143850, IITRI-C6233-48
Contract: NAS8-26791
Monitor: 18

Abstract: The development of a large scale manufacturing method for the production of a stable zinc orthotitanate pigment is studied, with emphasis placed on the comprehensive analysis of the properties and environmental stability of oxalate precursor zinc orthotitanate pigments and of the preparative conditions (time and temperature) leading to optimum properties and optical stability. (Author)

Descriptors: *Coatings, *Solar reflectors, *Spacecraft structures, *Surface stability, *Temperature control, Environment effects, Heat shielding, Manufacturing, Oxalates, Pigments, Zinc coatings

Identifiers: NTISNASA

N75-24937/5ST NTIS Prices: PC$4.75/MF$2.25

Development of Space Stable Thermal Control Coatings for Use on Large Space Vehicles

IIT Research Inst., Chicago, Ill.

Triannual Report, 1 Jan. - 31 Apr. 1974.
Gilligan, J. E., Harada, Y.
C4803D2 Fld: 22B, 84C STAR1312
Aug 74 38p
Rept No: NASA-CR-120723, IITRI-C6233-40
Contract' NAS8-26791
Monitor: 18

Abstract: The development of a large scale manufacturing method for the production of a stable zinc orthotitanate pigment is discussed. Major emphasis was placed on the evaluation of the radiation stability of Tektronix, Inc. pigments and of the conditions (time and temperature) leading to high reflection and high optical stability. Paints were formulated in OI-650 and in OI-650G vehicles from pigments which were prepared at various temperatures, some of which were chemically treated to remove ZnO. Ultraviolet irradiation tests of these paints were performed, and observations made regarding optimum pigment preparation parameters. (Author)

Descriptors: *Protective coatings, *Spacecraft shielding, *Thermal control coatings, *Ultraviolet radiation, Performance tests, Pigments, Reflectance, Stability tests, Temperature effects, Zinc coatings

Identifiers: NTISNASA

N75-20452/9ST NTIS Prices: PC$3.75/MF$2.25

Development of Space Stable Thermal Control Coatings for Use on Large Space Vehicles

IIT Research Inst., Chicago, Ill. Technology Center.

Triannual Report, 1 May - 31 Aug. 1974.
Gilligan, J. E., Harada, Y.
C4803D1 Fld: 22B, 84C STAR1312
Oct 74 112p
Rept No: NASA-CR-120722, IITRI-C6233-44
Contract: NAS8-26791
Monitor: 18

Abstract: The development of a large scale manufacturing method for the production of a stable zinc orthotitanate pigment is discussed. Major emphasis was placed on the evaluation of ultraviolet radiation stability tests of pigments derived from coprecipitated and individually precipitated oxalates. Emphasis was also placed on an investigation of the conditions (time and temperature) leading to high reflectance and high optical stability. Paints were formulated in OI-650 and in OI-650G vehicles from pigments which were prepared at various temperatures. Analyses of ultraviolet irradiation test data were conducted regarding optimum pigment preparation parameters and treatment conditions. (Author)

Descriptors: *Protective coatings, *Spacecraft shielding, *Thermal control coatings, *Ultraviolet radiation, Oxalates, Performance tests, Pigments, Reflectance, Stability tests, Zinc coatings

Identifiers: NTISNASA

N75-20451/1ST NTIS Prices: PC$5.25/MF$2.25

Analytic and Experimental Evaluation of Shadow Shields and Their Support Members for Thermal Control of Space Vehicles

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Boyle, R. J., Stochl, R. J.
C3515H3 Fld: 20M, 81E STAR1218
Jun 74 138p
Rept No: NASA-TN-D-7612, E-7344
Monitor: 18

Abstract: The thermal performance of shadow shields, and their support struts, for the thermal protection of cryogenic propellants in a simulated deep-space environment was investigated analytically and experimentally. Very low overall heat-transfer rates were obtained when highly reflective aluminized Mylar shadow shields were used. The thermal interactions between the shields and support struts were investigated with fair to good agreement between the analysis and experimental data. The exterior surface of both fiberglass and titanium struts was coated to reduce the heat input into the test tank. The vacuum level inside the test facility strongly influenced the heat-transfer rates. (Author)

Descriptors: *Cryogenic fluid storage, *Heat shielding, *Heat transfer, *Thermal protection, Mylar (Trademark), Spacecraft components, Surface properties, Temperature control

Identifiers: NTISNASA

N74-29325/9 NTIS Prices: PC$4.75/MF$2.25

Prospero: The First Year in Orbit

Royal Aircraft Establishment, Farnborough (England).
Adams, V. W.
C2902I1 Fld: 22C, 84D STAR1210
Sep 73 31p
Rept No: RAE-TR-73114, BR37104
Monitor: 18

Abstract: The orbital operations and overall behavior of the satellite Prospero (1971-3A) launched from Woomera on 28th October 1971 into an eccentric, near-polar orbit with a perigee height of 547 km, an apogee height of 1582 km, and an inclination of 82.06 deg is presented. The satellite orbit, attitude, spin, power supply system, and data systems are described. Experiments on thermal control surfaces, hybrid electronics, and micrometeoroid detection are detailed. It is concluded that Prospero has proved to be a very successful spacecraft, and experience gained is being used in studies for future satellites, particularly in formulating orbital operations.

Descriptors: *Black knight rocket vehicle, *Earth satellites, European space programs, Satellite orbits, Satellite-borne instruments, Solar cells, Spacecraft performance, Systems analysis, Thermal control coatings

Identifiers: NASA

N74-19522/3 NTIS Prices: PC$4.75/MF$1.45

C-2

Development of Space Stable Thermal Control Coatings for Use on Large Space Vehicles

IIT Research Inst., Chicago, Ill. Technology Center.

Triannual Report, 1 May - 31 Aug. 1972
Gilligan, J. E.
C0663B1 Fld: 11C, 71E, 84C STAR1107
25 Sep 72 73p
Rept No: NASA-CR-124003, IITRI-C6233-20
Contract: NAS8-26791, IITRI PROJ. C6233
Monitor: 18

Abstract: A reserach project to develop space stable thermal control coatings for large surfaces is discussed. Four major tasks are considered: (1) pigment development, (2) binder development, (3) environmental effects evaluations, and (4) general coatings investigations. (Author)

Descriptors: *Spacecraft components, *Temperature control, *Thermal control coatings, *Thermal insulation, Materials tests, Product development, Thermodynamic properties

Identifiers: NASA

N73-16922 NTIS Prices: PC$5.75/MF$0.95

Scorch: A Computer Code for Calculating Aerodynamic Heating on Reentry Vehicles and Control Surfaces

Sandia Labs., Livermore, Calif. (5660000)
Lemmon, E. C., Bramlette, T. T., Coleman, H. W.
A6764F2 Fld: 22C, 84D NSA3101
Jul 73 49p
Contract: AT(29-1)-789
Monitor: 18

Abstract: For abstract, see NSA 31 01, number 02635.

Descriptors: (*Computer codes, *S codes), (*Space vehicles, *Reentry), Aerodynamics, Control systems, Heat transfer, Heating, Numerical solution, Surfaces

Identifiers: NTISAEC

SLL-73-0248 NTIS Prices: PC$5.50/MF$2.25

Development of Space Stable Thermal Control Coatings for Use on Large Space Vehicles

IIT Research Inst., Chicago, Ill.

Triannual Report, 1 Sep. - 31 Dec. 1971
Gilligan, J. E., Boutin, R. F., Leas, R. M., Ashford, N. A.
A4813I2 Fld: 11C, 71E STAR1015
31 Dec 71 72p
Rept No: NASA-CR-123629, IITRI-C6233-12
Contract: NAS8-26791

Abstract: The evaluation and environmental testing of zinc orthotitanate pigments for use as space stable thermal control coatings on large space vehicles are discussed. Electron paramagnetic resonance spectra of the pigments and their precursor compounds are examined. A continuing study of the spectral intensity of mercury-argon and mercury-xenon sources in reported. Results of long term environmental testing of commercially available, strippable, protective coatings are discussed. (Author)

Descriptors: *Ablative materials, *Heat shielding, *Thermal control coatings, *Thermal insulation, Chemical properties, Environmental tests, Materials tests, Physical properties

N72-24606 NTIS Prices: PC$5.75/MF$0.95

Investigation of Environmental Effects on Coatings for Thermal Control of Large Space Vehicles

IIT Research Inst., Chicago, Ill.

Final Report, 20 May 1963 - 8 Oct. 1971
Zerlaunt, G. A., Gilligan, J. E., Ashford, N. A.
A4371A2 Fld: 11C, 71E STAR1009
8 Oct 71 377p
Rept No: NASA-CR-123531, IITRI-U6002-97
Contract: NAS8-5379, IITRI PROJ. U6002

Abstract: The objective of significantly advancing the state-of-the-art of white, spacecraft-radiator coatings has been realized in a comprehensive goal-oriented, pigmented-coatings research program. Considered were inorganic pigments and coatings, silicone polymers and coatings, the design and construction of a combined ultraviolet-plus-proton irradiation facility, the development of zinc orthotitanate pigment and coatings, and the effects on several low alpha sub sepsilon paints of combined ultraviolet and proton irradiation. (Author)

Descriptors: *Spacecraft shielding, *Sprayed coatings, *Thermal control coatings, Organic silicon compounds, Paints, Pigments, Radiation protection, Titanates, Zinc compounds

N72-18576 NTIS Prices: PC$6.00/MF$0.95

Evaluation and Selection of Refrigeration Systems for Lunar Surface and Space Applications

Vought Missiles and Space Co., Dallas, Tex.
Copeland, R. J., Blount, T. D., Williams, J. L.
A4162J1 Fld: 22B, 84C STAR1007
31 Oct 71 233p
Rept No: NASA-CR-115352, T-122RP04
Contract: NAS9-9912

Descriptors: *Lunar surface vehicles, *Refrigerating machinery, *Spacecraft radiators, Environmental control, Heat shielding, Performance tests, Prediction analysis techniques

N72-16933 NTIS Prices: PC$3.00/MF$0.95

Development of a Space Stable Thermal Control Coatings for Use in Large Space Vehicles

IIT Research Inst., Chicago, Ill.

Triannual Report, 1 May - 31 Aug 1971
Gilligan, J. E., Ashford, N. A., Harada, Y. , Leas, R. M.
A3934C3 Fld: 11C, 71E STAR1003
15 Oct 71 52p
Rept No: NASA-CR-121035, IITRI-C6233-8
Contract: NAS8-26791

Descriptors: *Aerospace environments, *Protective coatings, *Spacecraft, *Temperature control, *Thermal protection, Mechanical properties, Pigments, Solar radiation, Zinc compounds

N72-12944 NTIS Prices: PC$3.00/MF$0.95

Spacecraft Radiation Torques - Space Vehicle Design Criteria (Guidance and Control)

National Aeronautics and Space Administration, Washington, D. C.
A2441H1 Fld: 22B, 84C STAR0912
Oct 69 41p
Rept No: NASA-SP-8027

Descriptors: *Attitude control, *Radiation effects, *Radiation sources, *Spacecraft stability, *Torque, Electromagnetic radiation, Infrared radiation, Solar radiation, Spacecraft configurations, Surface properties

Identifiers: NASA subject code 31

N71-24312 NTIS Prices: PC$3.00 MF$0.95

Thermodynamics and Thermophysics of Space Flight Proceedings Held at Palo Alto, California on March 23-25, 1970

Lockheed Missiles and Space Co Sunnyvale Calif (210120)

Final rept.
Cohan, Henry, Calvert, D. L., Satterlee, H. M.
A1614C3 Fld: 22B, 20M, 84A, 80P GRAI7106
Jan 71 296p
Contract: F44620-69-C-0120
Project: AF-9781
Task: 978101
Monitor: AFOSR-TR-71-0079
Availability: Paper copy available from Western Periodicals Company, 1300 Raymer St., North Hollywood, Calif. 91605. $17.00.

Abstract: The newly developed engineering science of spacecraft temperature control continues to change at a rapid pace. As a means of assisting and encouraging the disemination of new developments a symposium was held at the Lockheed Research Labs. in 1970. The symposium was jointly sponsored by the Air Force Office of Scientific Research and the Lockheed Missiles and Space Co. The technical program of 17 papers in four broad catagories comprises the contents of this volume. Four general classes of papers are presented: New computational techniques with complex computer design and optimal control theory; point designs for a solar array, an antenna and an optics system; thermal control techniques for energy exchange with high flux rates, passive systems and coolant loop systems design; and materials development with special coatings and insulations for spacecraft surfaces. (Author)

Descriptors: (*Spacecraft, *Temperature control), (*Space flight, Thermodynamics), Symposia, Solar radiation, Mathematical models, Surface properties, Perturbation theory, Optics, Satellites(Artificial), Antenna configurations, Programming(Computers), Materials, Thermal insulation, Lifting reentry vehicles

AD-717 822 NTIS Prices: MF$0.95

INTEGRATION OF N A S A-SPONSORED STUDIES ON ALUMINUM WELDING

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Masubuchi, K.
4115B1 Fld: 13H, 22D STAR0601
Sep 67 170p
Rept No: NASA-TM-X-60591, RSIC-670
Contract: DA-01-021-AMC-14693/Z/
Sci. Inform. Center Date- Sep. 1967 Coll- 170 P Refs Prep-Prepared Jointly With Army Missile Command

Descriptors: *Aluminum alloys, *Saturn 5 launch vehicles, *Structural members, *Welding, Gas analysis, Inspection, Porosity, Surface finishing, Temperature control, Time

N68-10344 CFSTI Prices: PC$6.00 MF$0.95

VOYAGER CAPSULE PHASE B. VOLUME III - SURFACE LABORATORY SYSTEM. PART C2 - SUBSYSTEM FUNCTIONAL DESCRIPTION FINAL REPORT

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mcdonnell Aircraft Corp., St. Louis, Mo.
4072A2 Fld: 22B, 22A STAR0524
31 Aug 67 191p
Rept No: NASA-CR-89696, F694, VOL. III, PT. C2
Contract: NAS7-100, JPL-952000
Prepared for Jpl

Descriptors: *Landing module, *Mars surface, *Space capsule, *Spacecraft component, *Voyager project, Cable, Capsule, Component, Control, Design, Entry, Equipment, Exploration, Instrument, Laboratory, Landing, Mars (planet), Module, Packaging, Pyrotechnics, Science, Soft, Space, Spacecraft, Subsystem, Surface, Thermal, Unmanned, Vehicle

N67-40586 CFSTI Prices: PC$6.00 MF$0.95

VACUUM CHAMBER HEAT-TRANSMISSION ANALYSIS

National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
Ellis, W. E., Guy, W. W.
3143G3 Fld: 20M, 22A STAR0507
Feb 67 13p
Rept No: NASA-TM-X-1355
Contract: 914-50-80-02-72
Monitor: 18

Descriptors: *Deep space, *Heat transfer, *Pressure effect, *Thermal simulation, *Vacuum chamber, Analysis, Apollo spacecraft, Chamber, Conduction, Control, Deep, Effect, Emission, Environment, Error, Gas, Heat, Level, Pressure, Simulation, Space, Surface, Temperature, Test, Thermal, Transfer, Vacuum, Vehicle

N67-17513 CFSTI Prices: PC$3.00 MF$0.95

THE SUBLIMATION OF GRAPHITE AT HYPERSONIC SPEEDS

General Electric C Philadelphia P Missile and Space Div (000000)
Scala, S. M., Gilbert, L. M.
1185L3 USGRDR
Aug 64 2p
Rept No: r64SD55
Contract: AF04 647 269 , AF04 694 222
Prepared for presentation at the AIAA Entry Technology Conference, NASA Langley Research Center, 12-14 Oct 64.

Abstract: A new theoretical model is presented for the sublimation of graphite at hypersonic flight speeds. The aerothermochemical interactions between dissociated air and graphite are treated by means of a nine component model, including O, O2, N, N2, CO, CO2, C, C3 and CN. The mass transfer rate, the heat transfer rate, and the skin friction coefficient are determined numerically and are then correlated by means of algebraic equations, as a function of stagnation pressure, stagnation enthalpy and wall temperature in the high Reynolds number laminar flow regime. (Author)

Descriptors: (*GRAPHITE, SUBLIMATION), (*HYPERSONIC FLIGHT, GRAPHITE), HYPERSONIC CHARACTERISTICS, MATHEMATICAL MODELS, GASES, AIR, DIFFERENTIAL GEOMETRY, TRANSPORT PROPERTIES, THERMODYNAMICS, BOUNDARY LAYER, REACTION KINETICS, REYNOLDS NUMBER, LAMINAR FLOW, FRICTION, HIGH-TEMPERATURE RESEARCH, REFRACTORY MATERIALS, AEROSPACE CRAFT, ABLATION, HEAT SHIELDS, AERODYNAMIC HEATING, RE-ENTRY VEHICLES, SURFACE TEMPERATURES, PRESSURE, PYROLYTIC GRAPHITE, AERODYNAMIC CONTROL SURFACES

AD-605 199 CFSTI Price: PC$3.00

DEVELOPMENT OF THERMAL CONTROL COATINGS FOR SPACE VEHICLES

National Aeronautics and Space Administration, Washington, D. C.
Mook, C. P.
1022E2 Fld: 20M STAR0419
1964 7p
Rept No: NASA-TM-X-54906
Presented At the Govt. Paint Symp., Ann. Meeting of the Natl. Paint, Varnish and Lacquer Assoc., Dallas, 11 Nov. 1964

Descriptors: *Protective coating, *Space vehicle, *Thermal protection, Carbon, Coating, Control, Development, Dioxide, Epoxy, Oxide, Paint, Pigment, Protection, Silicone, Space, Thermal, Titanium, Vehicle, White, Zinc

N66-33378 CFSTI Prices: PC$3.00 MF$0.95

HEAT-TRANSFER AND PRESSURE DISTRIBUTIONS ON A FLAT-FACE ROUNDED-CORNER BODY OF REVOLUTION WITH AND WITHOUT A FLAP AT A MACH NUMBER OF 8

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Jones, R. A.
1021I3 Fld: 20M STAR0419
Sep 62 59p
Rept No: NASA-TM-X-703

Descriptors: *Body of revolution, *Flap control, *Flat surface, *Heat transfer, *Hypersonic speed, *Pressure distribution, *Zero angle of attack, Afterbody, Angle of attack, Body, Control, Corner, Distribution, Enthalpy, Face, Flap, Flat, Gas, Point, Pressure, Real, Reentry, Revolution, Reynolds number, Round, Stagnation, Surface, Vehicle, Zero

N66-33334 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF PASSIVE TEMPERATURE CONTROL COATINGS FOR USE ON THE APOLLO VEHICLE ABLATIVE THERMAL PROTECTION SYSTEM FINAL REPORT

Avco Corp., Wilmington, Mass. Space Systems Div.
Gannon, R. E., Hughes, C. T., Laszlo, T. S., Rand, M.
0963D1 Fld: 20M STAR0415
Apr 66 128p
Rept No: NASA-CR-65366, AVSSD-0012-66-RR
Contract: NAS9-3406

Descriptors: *Apollo spacecraft, *Protective coating, *Temperature control, *Thermal protection, Ablation, Aluminum, Cloth, Coating, Control, Fabric, Fiberglass, Foil, Multilayer, Passive, Protection, Spacecraft, System, Temperature, Thermal

N66-27227 CFSTI Prices: PC$6.00 MF$0.95

THERMAL CONTROL OF SPACE VEHICLES

Patent assigned to NASA
Clemmons, Dewey L. Jr
0194J3 Fld: 22B, 11C USGRDR4014
6 Apr 65
Monitor: 18
Available from Commissioner of Patents, Washington, D.C., 20231, $0.25

Abstract: The space vehicle is of the type similar to the Echo I satellite. It is carried into space in the nose cone of a missile. The vehicle has an exterior aluminum surface. A thickness of the aluminum surface is chemically converted into an amorphous phosphate layer.

Descriptors: (*Satellites(Artificial), Temperature control), Communication satellites(Passive), Patents, Phosphate coatings, Aluminum, Surfaces, Laminates, Composite materials, Inflatable structures, Polyester plastics, Foils

Patent 3,176,933

STUDY OF A DRAG BRAKE SATELLITE RECOVERY SYSTEM, VOLUME II

Avco-Everett Research Lab., Mass.
0035E1 Fld: S18 USGRDR3908
Rept No: ASD-TR-61-348-Vol-2
Contract: AF33(600)41291
Monitor: 18

Descriptors: *Satellite(Artificial), *Drag, *Air brake flaps, *Atmosphere entry, *Space capsules, *Aerodynamic control surfaces, Recovery, Re-entry vehicles, Deceleration, Design, Materials, Wire screens, Heat resistant paints, Instrumentation, Telemeter systems

AD-275 253

ANODIZED ALUMINUM COATINGS FOR TEMPERATURE CONTROL OF SPACE VEHICLES

Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
Weaver, James H.
0025H4 Fld: S18 USGRDR3906
Rept No: ASD-TDR-62-918
Monitor: 18

Descriptors: *Spacecraft, *Heat shields, *Metal coatings, *Aluminum coatings, Temperature control, Reflectors, Solar radiation, Ultraviolet radiation

AD-402 381

Evaluation of Coated Columbium Alloy Heat Shields for Space Shuttle Thermal Protection System Application

General Dynamics/Convair, San Diego, Calif.

Final Report.
Black, W. E.
D2911J1 Fld: 11F, 22B, 71N, 84G, 84C STAR1513
Apr 77 67p
Rept No: NASA-CR-2824, CASD-NAS-76-056
Contract: NAS1-9793
Monitor: 18

Abstract: A three-phase program to develop and demonstrate the feasibility of a metallic heat shield suitable for use on Space Shuttle Orbiter class vehicles at operating surface temperatures of up to 1590 K (2400 F) is summarized. An orderly progression of configuration studies, material screening tests, and subscale structural tests was performed. Scale-up feasibility was demonstrated in the final phase when a sizable nine-panel array was fabricated and successfully tested. The full-scale tests included cyclic testing at reduced air pressure to 1590 K (2400 F) and up to 158 dB overall sound pressure level. The selected structural configuration and design techniques succesfully eliminated thermal induced failures. The thermal/structural performance of the system was repeatedly demonstrated. Practical and effective field repair methods for coated columbium alloys were demonstrated. Major uncertainties of accessibility, refurbishability, and durability were eliminated.

Descriptors: *Heat shielding, *Niobium alloys, *Space shuttle orbiters, *Thermal protection, Coatings, Feasibility, Life (Durability), Quality control

Identifiers: Spacecraft, High temperature tests, NTISNASA

N77-22531/6ST NTIS Prices: PC$4.50/MF$3.00

Degradation of Thermal Control Coatings by Ultraviolet and Particle Irradiation Effects Etude des Degradations de Revetements de Controle Thermique Sous l'Effet des Rayonnements Ultraviolets et Particulaires

Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.

Final Report.
Bourrieau, J., Paillous, A., Romero, M.
D2901L2 Fld: 22B, 18H, 84C, 84G STAR1512
Oct 76 127p
Rept No: ESA-CR(P)-892
Contract: ESTEC-2515/75-HP
Monitor: 18
Language in French.

Abstract: An analysis is presented of thermal control coating degradation by ultraviolet, electron, or proton irraciation based on existing literature. Results of ultraviolet irradiation of the same material are very dispersec since wavelengths and light sources may vary. The influence of intensity or temperature is also noted. Results of electron or proton irradiation seem compatible notwithstanding their apparent dispersion. It is shown that variation of the cptical absorption coefficient is directly linked to the average value of the energy dose absorbed in the degraded material layer. The effects of temperature and intensity are noted also in this case. The information can be used to select the best simulation conditions. An experimental and thermal study program is proposed.

Descriptors: *Electron irradiation, *Proton irradiation, *Radiation effects, *Thermal control coatings, *Ultraviolet radiation, Degradation, Light sources, Space environment simulation, Temperature effects

Identifiers: Spacecraft, France, NTISNASAE

N77-21375/9ST NTIS Prices: PC$6.00/MF$3.00

Macrolaminate Particle Composite Material Development

Boeing CO Seattle Wash (059 600)

Interim rept. no. 6, 1 Feb-1 Apr 65
Simpson, F. H., Stejskal, L. M.
D272512 Fld: 11D d7716
1 Apr 65 16p
Contract: NOw-64-0194
Monitor: 18
Distribution limitation now removed. NOTE: Only 35mm microfilm is available. No microfiche.

Abstract: This report describes work accomplished on the development of macrolaminate particle composites. Specimens made from cubical shaped particles had better oxidation resistance and higher compressive strength than those made using plate-like particles. Specimens made using rectangular shaped particles with one axis elongated have nearly comparable oxidation and compressive properties to those made from cubical particles and have higher flexural strength. Flexural strength, compressive deformation and weight loss due to oxidation increase with increasing metal content in the composite. The rate of weight loss due to oxidation increases with increasing metal content. Results from hot pressing, isostatic pressing and warm pressing experiments are summarized. Substantial improvements in sintering of the composite have not been realized either by increasing pressure in the vacuum furnace or through use of wet hydrogen. Yielding in flexural specimens prior to ultimate failure was obtained in specimens sintered in, wet hydrogen and not in those sintered in vacuum. (Author)

Descriptors: (*Composite materials, Laminates), (*Laminates, Composite materials), Heat resistant materials, Molybdenum, Ceramic coatings, Oxides, Magnesium compounds, Dioxides, Hafnium compounds, Cerium compounds, Deformation, Compressive properties, Oxidation, Failure (Mechanics), Creep, Material forming, Hot working, Controlled atmospheres, Hydrogen, Sintering, Vacuum furnaces, Particle size

Identifiers: Hafnium dioxide, Particulate composites, NTISDODXD

AD-462 748/5ST NTIS Prices: PC$3.50/MF$3.00

Solar Cell Assembly

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

Patent.
Brandhorst, H. W. Jr
D2682G1 Fld: 10B, 90, 97N STAR1510
Patented 2 Nov 76 5p
Rept No: PATENT-3 989 541, PAT-APPL-510 677
Monitor: 18
Misc-Filed 30 Sep. 1974 Supersedes N74-33484 (12 - 23, p 2775).
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of Patent available Commissioner of Patents, Washington, D.C.

Abstract: The solar cell assembly includes a solar cell having an overlay of a semi-transparent coating of a metal, such as aluminum or silver, which covers the entire surface thereof. The purpose of the coating is to lower the amount of incident radiation on the cell and thereby lower cell temperature. The use of the semi-transparent coating over the entire cell, surface uniformly limits incident radiation and hence reduces cell heat without any temperature gradients. The coating also lowers series cell resistance. The coating may be directly deposited on the cell surface or on the undersurface of a cover plate bonded to the cell.

Descriptors: *Solar cells, *Patents, Incident radiation, Luminous intensity, Heat shielding, Metal coatings, Protective coatings

Identifiers: PAT-CL-136-89, Aluminum, Silver, Temperature, Thermal control coatings, NTISNASA

N77-19571/7ST NTIS Price: Not available NTIS

Study of Vacuum Welding

National Research Corp Cambridge Mass Norton Exploratory Research Div (400 489)

Interim rept. 2 Mar 64-15 Jun 65
Brock , F. J., Fasolino , L. G., Hordon, M. J.
D2602L1 Fld: 13H, 11F d7715
Aug 65 66p
Rept No: 82-1-0218
Contract: AF04(611)-9717
Project: AF-6753
Monitor: AFRPL-TR-65-175
Distribution limitation now removed.

Abstract: Cold welding between aluminum, copper, stainless steel (440 C and 17-4 PH), and tungsten carbide was studied experimentally over the temperature range of 90 to 260 C with interface contact stresses at 0,100 and 1000 psi under extremely low pressures about 5 x 10 to the minus 13th power torr. Adhesion after abrasion was studied under the same conditions. Vacuum effects were separated from temperature effects by conducting the tests both in vacuum and unit temperature effects by conducting the tests both in vacuum and unit atmosphere of argon. The effectiveness of anti-adhesion coatings (aluminum oxide, chromium oxide, zirconium oxide and molybdenum disulfide) was studied under the same conditions. A review of existing cold welding theories was made and a set of design criteria developed to aid in preventing welding. (Author)

Descriptors: (*Welding, Vacuum), Aluminum alloys, Copper, Stainless steel, Carbides, Tungsten alloys, Abrasives, Argon, Controlled atmospheres, Adhesion, Reduction, Space environments, Coatings, Oxides, Chromium compounds, Aluminum compounds, Dioxides, Zirconium compounds, Sulfides, Molybdenum compounds, Temperature, Shear stresses, Separation, Bonding, Friction, Surfaces

Identifiers: Aluminum alloy 2014, Alumina, Chromium(III) oxide , Molybdenum(IV) sulfide, Steel 1050, Steel 17-4 ph, Steel 440c, Tungsten carbide, Zirconium oxides, NTISDODXD

AD-475 595/5ST NTIS Prices: PC$4.50/MF$3.00

Particulate and Solar Radiation Stable Coating for Spacecraft

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

Patent.
Slemp, W. S.
D2533B2 Fld: 22B, 11C, 84G, 71E, 90 STAR1509
Patented 15 Feb 77 4p
Rept No: PATENT-4 008 348. PAT-APPL-578 240
Monitor: 18
Misc-Filed 16 May 1975 Supersedes N75-29431 (13 - 20, p 2526). Subm-Continuation-in-Part of Abandoned US Patent Appl. Sn-428992, Filed 27 Dec. 1973.
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of Patent available Commissioner of Patents, Washington, D.C.

Abstract: A laminate thermal control coating for spacecraft comprising a layer of solar radiation stable film, a layer of particulate radiation stable film applied to the upper surface of the solar radiation stable film, and a layer of reflecting material applied to the lower surface of the solar raciation stable film was described. The coating experiences no increase in solar radiation absorptance (the proportion of radiant energy absorbed) upon exposure to particulate or solar radiation as the particulate radiation is substantially absorbed in the particulate radiation stable layer and the solar radiation partially absorbed by the particulate radiation stable layer is transmitted by the solar raciation stable film to the reflecting material which reflects it back through the laminate and into space.

Descriptors: *Solar radiation, *Spacecraft structures, *Thermal control coatings, *Patents, Film cooling, Heat shielding, Laminates, Radiation absorption

Identifiers: PAT-CL-428-35, NTISNASA

N77-18382/0ST NTIS Price: Not available NTIS

Thermal Barrier Coatings: A Near Term, High Payoff Technology

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Levine, S. R., Clark, J. S.
D2391G1 Fld: 11C, 13A, 21E, 71E, 81D STAR1508
1977 15p
Rept No: NASA-TM-X-73586, E-9049
Monitor: 18
Subm-Prepared in Cooperation with US Army Air Mobility R and D Lab., Cleveland. Conf-Presented at the Workshop on Ceramics for Energy Conversion Systems, Orlando, Fla., 24-26 Jan. 1977; Sponsored by Erda.

Abstract: The present status of thermal barrier coatings is reviewed including both experimental results and forecasts of the benefits derived from use of these coatings in aircraft and utility gas turbines. The potential of thermal barrier coatings relative to structural ceramics is discussed along with a development plan for these coatings. Performance of various oxide ceramic thermal barrier layers are considered; variables include cycles to failure, leading-edge wall temperature, coolant-to-gas flow ratio, time, weight change, thermodynamic efficiency, and specific output; 4 figures and 1 table include numeric data.

Descriptors: *Thermal control coatings, Technological forecasting, Technology assessment, Aircraft engines, Ceramics , Gas turbines, Protective coatings, Turbine blades, Failure, Thermal cycling tests, Thermodynamic efficiency, Time, Wall temperature, Weight reduction

Identifiers: NTISNASA

N77-17239/3ST NTIS Prices: PC$3.50/MF$3.00

Pulsed Plasma Plume Studies

Fairchild Republic Co Farmingdale N Y (408278)

Final rept. Mar 75-Nov 76
Guman, William J., Begun, Martin
D1993C3 Fld: 21C, 22B, 81B, 84G GRAI7711
Mar 77 100p
Contract: F04611-75-C-0037
Project: 3058
Task: 12
Monitor: AFRPL-TR-77-2

Abstract: The exhaust plume of a millipound thrust level pulsed plasma thruster was studied in a vacuum chamber having all walls cooled by liquid nitrogen. This thruster has a propulsive performance capable of meeting North-South station-keeping requirements of satellites. The major source of contamination of a surface located in the facility was identified to be mainly due to mass being scattered off the walls of the test facility because the walls were incapable of absorbing the highly energetic plume of the first encounter with the wall. By means of a Langmuir probe, calorimetric discs, a collimated QCM and collimated glass capture cups it was found that the transient plume is fairly well collimated and that the outer extremities of the plume are located within + or - 30 degrees to + or - 40 degrees with respect to the geometric center line of the thruster that was studied. Whether or not major changes of the exhaust cone would change this location was not examined. Time resolved studies of the plume by a Langmuir probe and a photocell has shown the life of the plume at a region in space to be only a few tens of microseconds. This result reveals that a spacecraft surface exposed over a 5 to 7 year period to the plume of a North-South station keeping thruster will actually see an accumulated plume flow time for only about 5 minutes during that mission time.

Descriptors: *Electric propulsion, *Space propulsion, *Thrusters, *Exhaust plumes, *Plasma engines, Stationkeeping, Rocket exhaust, Spacecraft, Solar cells, Contamination, Surfaces, Solid propellants, Instrumentation, Test facilities, Vacuum chambers, Ion density, Temperature control

Identifiers: NTISDODXA

AD-A036 904/1ST NTIS Prices: PC$5.00/MF$3.00

Investigation of Nondestructive Methods for the Evaluation of Graphite Materials

Avco Missiles Space and Electronics Group Lowell Mass Avco Space Systems Div (401 409)

Technical rept. 15 Apr 66-15 Apr 67
Lockyer, G. E., Shultz, A. W., Serabian, S., Carter, S. W.
D1913L3 Fld: 11B d7710
Jun 67 170p
Rept No: AVSSD-0228-67-CR
Contract: AF 33(615)-3942, AF 33(615)-1601
Monitor: AFML-TR-67-128
Distribution limitation now removed.

Abstract: A program of investigation was begun in April 1964, to determine nondestructive methods and techniques for evaluating and characterizing graphite materials. The properties and behavior characteristics of graphite which are important to ablative applications were identified and correlated with the applicable NDT methods and techniques during the first year. Emphasis was directed in verification of the applicability of the various NDT techniques and correlation to characterize graphite in relation to service performance has been an item of major concern. Statistical analysis of these correlations has established the significance of the correlations for predicting the related material properties. An extensive analysis of the application of NDT flaw testing and properties evaluation in regard to quality and reliability is presented. A detailed discussion of infrared technique development activities for measuring thermal properties is also presented. The influence of attenuation and the related effects of frequency distortion on velocity measurements is evaluated and described.

Descriptors: (*Graphite, Nondestructive testing), Standards, Ablation, Thermal properties, Thermal shock, Radiometers, Measurement, Thermal stresses, Heat shields, Thermal conductivity, Attenuation, Thermodynamics, Surface properties, Quality control

Identifiers: Ablative materials, NTISDODXD

AD-816 960/9ST NTIS Prices: PC$6.75/MF$3.00

Reflectivity Measurements of Selected Thermal Control Coatings Irradiated in High Vacuum

General Dynamics/Fort Worth Tex Nuclear Aerospace Research Facility (147 820)

Technical rept. 1 Oct 64-1 Dec 66
McDaniel, R. H., Bell, J. R., Wattier, J. B.
D1905A3 Fld: 11C d7710
Jun 67 126p
Rept No: FZK-326
Contract: AF 29(601)-7077
Project: AF-6773
Task: 677302
Monitor: AFWL-TR-67-22
Distribution limitation now removed.

Abstract: Several specimens of each of the following types of thermal-control coatings were irradiated for 200 hrs at a power level of 3 Mw by the Ground Test Reactor: Acrylic TiO2, Silicon alkyd TiO2, 3M White Velvet, MgO acrylic, Fe2O3, M-polyvinyl butyrol TiO2, ZnO/K2O SiO2, YO2/K2O SiO2, Anodized aluminum, and PV 100. Reflectance values for each of the above types were determined in the 0.3- to 26.4-micro range. The specimens were irradiated at the west position of the GTR irradiation cell while in a high-vacuum (.000001 torr) environment. The integrated neutron and gamma doses incident on the specimens were 10 to the 17th power nvt (E>10 kev) and 2 x 10 to the 11th power ergs/gm(C), respectively. After the apparatus containing the specimens had decayed sufficiently for safe handling, reflectance measurements were made. In the 0.3- to 2.2-micron range, the reflectance was measured in high vacuum (.000001 torr) by use of a MgO reference, a MgO-coated integrating sphere, a tungsten source, a fused-silica prism, and photomultiplier and lead sulphide detectors. In the 2.2- to 26.4- micron range, the reflectance was measured by use of a hohlraum, a gold reference, KBr, and CaF2 prisms, and a high-sensitivity thermocouple detector. The reflectance data obtained in this experiment indicated that all the thermal-control coatings except Fe2O3 were damaged to some extent by the reactor radiation. The MgO acrylic coating displayed the most change throughout the complete spectral range (0.3-26.4 microns). (Author)

Descriptors: (*Refractory coatings, Reflection), Vacuum, Damage, Radiation effects, Space environments, Titanium compounds, Dioxides, Magnesium compounds, Iron compounds, Silicones, Silicates, Oxides, Silicon dioxide, Acrylic resins, Spectrophotometers, Dosimeters, High orbit trajectories, Spacecraft, Thermal radiation, Blackbody radiation, Heat transfer, Emissivity, Solar radiation

Identifiers: NTISDODXD

AD-815 911/3ST NTIS Prices: PC$6.00/MF$3.00

Effects of Hydrogen Treatment on the Ductility of Molybdenum under 760 and 10 to the Minus 10TH Power Torr

Aerospace Corp El Segundo Calif Labs Div (401 932)

Rept. for Mar 65-Jun 66
Feuerstein, Seymour
D1882C1 Fld: 11F, 20K d7710
Jan 67 24p
Rept No: TR-1001(2250-20)-4
Contract: AF 04(695)-1001
Monitor: SSD-TR-67-35
Distribution limitation now removed.

Abstract: Room-temperature tensile experiments on polycrystalline molybdenum indicate a grain size and heat treatment contribution to the difference in strain-to-fracture of specimens deformed at 760 Torr to those deformed at 10 to the -10th power Torr. The magnitude of the effect appears to depend critically on grain size and impurity distributions resulting from heat treatment with and without a hydrogen atmosphere. However, it has been determined that the ductility effects are predominantly due to a change in ductility of specimens tested at atmospheric pressure. Ultrahigh vacuum tensile behaviors are relatively unaffected. The largest difference in strain-to-fracture (approximately 13%) was in a narrow grain-size range in which specimens were first recrystallized and then soaked in a hydrogen atmosphere. The enhancement of ductility of hydrogen-treated specimens under vacuum suggests the involvement of a hydrogen-related gaseous contaminant. (Author)

Descriptors: (*Hydrogen embrittlement, Molybdenum), (*Molybdenum, Low pressure), Vacuum, Ductility, Environmental tests, Controlled atmospheres, Impurities, Polymerization, Strain(Mechanics), Heat treatment, Grain size, Surface area, Cracks, Tensile properties

Identifiers: Polycrystallines, NTISDODXD

AD-813 026/2ST NTIS Prices: PC$3.50/MF$3.00

Nasa Office of Aeronautics and Space Technology Summer Workshop. Executive Summary

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
D1825L2 Fld: 5A, 22A, 22B, 84A, 70E, 84C STAR1504
Aug 75 92p
Rept No: NASA-TM-X-73960
Grant: NSG-1186
Monitor: 18
Seri-11. Subm-Prepared Jointly with Old Dominion Univ., Norfolk, VA. Conf-Conducted at Madison College, Harrisonburg, VA., 3-16 Aug. 1975.

Abstract: Research and technology investigations are identified in eleven discipline technologies which require or which could significantly benefit from an in-space experiment, systems demonstrations, or component test using the Space Transportation System. Synopses of the eleven technology panels reports are presented.

Descriptors: *Aerospace environments, *Conferences, *Mission planning, *Research projects, *Space transportation, *Spacelab , Cryogenics, Data processing, Life support systems, Space manufacturing, Space shuttles, Thermal control coatings, User requirements

Identifiers: *Meetings, NTISNASA

N77-13921/0ST NTIS Prices: PC$5.00/MF$3.00

Nasa Office of Aeronautics and Space Technology Summer Workshop. Volume 8: Thermal Control Panel

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

Final Report.
D1825K2 Fld: 22A, 22B, 5A, 84A, 84C, 70E STAR1504
Aug 75 170p
Rept No: NASA-TM-X-73968
Grant: NSG-1186
Monitor: 18
Seri-11. Subm-Prepared Jointly with Old Dominion Univ., Norfolk, VA. Conf-Conducted at Madison College, Harrisonburg, VA., 3-16 Aug. 1975.

Abstract: Technology deficiencies in the area of thermal control for future space missions are identified with emphasis on large space structures and cold controlled environments. Thermal control surfaces, heat pipes, and contamination are considered along with cryogenics, insulation, and design techniques. Major directions forecast for thermal control technology development and space experiments are: (1) extend the useful lifetime of cryogenic systems for space, (2) reduce temperature gradients, and (3) improve temperature stability.

Descriptors: *Conferences, *Mission planning, *Spacelab, *Technology assessment, *Temperature control, Cryogenics, Life (Durability), Space shuttles, Temperature gradients, Thermal control coatings, Thermal stability

Identifiers: *Meetings, NTISNASA

N77-13917/8ST NTIS Prices: PC$6.75/MF$3.00

Testing and Fabrication of Solar Absorbers for the D5a' Satellite Mise au Point et Fabrication d'Absorbeurs Solaires pour le Satellite D5a'

Centre National d'Etudes Spatiales, Toulouse (France).
Simon, J., Riboulet, M.
D1815J1 Fld: 10B, 22B, 97N, 84C, 84G STAR1504
May 76 15p
Rept No: CNES-NT-37
Monitor: 18
In French; English Summary.

Abstract: A vacuum evaporated absorber coating consisting of layers of SiOx - NiCr - Al was developed for use on the French D5A' satellite. This coating has a solar absorptance coefficient of 0.70 and an infrared emittance coefficient of 0.045. Qualification tests (storage, humidity, thermal cycling, ultraviolet irradiation, particle irradiation, etc.) are reported.

Descriptors: *Fabrication, *Solar energy absorbers, *Thermal control coatings, French satellites, Qualifications, Aluminum, Nickel alloys, Silicon oxides, Thermal cycling tests, Vacuum deposition

Identifiers: Chromium alloys, Infrared radiation, Emissivity, Spacecraft, Quality control, Tests, France, NTISNASAE

N77-13110/0ST NTIS Prices: PC$3.50/MF$5.00

Transonic Stability and Control Characteristics of a 0.015 Scale Model 69-0 of the Space Shuttle Orbiter with Forebody Rsi Modification in the NASA/LARC 8 Foot Tpt (LA72)

Chrysler Corp., New Orleans, La. Space Div.
Ball, J. W., Edwards, C. R.
D1665H1 Fld: 1A, 22B, 51A, 84C STAR1503
Oct 76 155p
Rept No: NASA-CR-147644, DMS-DR-2309
Contract: NAS9-13247
Monitor: 18

Abstract: Tests were conducted in the NASA/LaRC 8 foot transonic wind tunnel from March 26 through 31, 1976. The model was a 0.015 scale SSV Orbiter with forebody modifications to simulate slight reductions in the reusable surface insulation (RSI) thickness. Six component aerodynamic force and moment data were obtained at Mach numbers from 0.35 to 1.20 over an angle of attack range from -2 deg to 20 deg at sideslip angles of 0 deg and 5 deg. (Author)

Descriptors: *Space shuttle orbiters, *Surface stability, Forebodies, Transonic wind tunnels, Aerodynamic forces, Angle of attack, Mach number, Thermal insulation

Identifiers: NTISNASA

N77-12108/5ST NTIS Prices: PC$6.75/MF$3.00

High Temperature Test Methods

General Dynamics/Convair San Diego Calif (147 650)
Moran, J. P., Schiff, E.
D1621L3 Fld: 20I, 20M, 22B d7708
31 Dec 58 119p
Rept No: GDC-ZR-658-026
Monitor: 18
Distribution limitation now removed.

Abstract: Heating, loading and test measurement equipment for use in high temperature structural tests was developed and improved, as follows: A vacuum type heat tension pac which will simultaneously load a skin surface up to 12.0 psi and heat it to 550 degrees F at rates of 20 degrees F/second. Several devices using infrared lamps for producing very high temperatures and high energy fluxes. Reflectors for high density infrared lamp banks include specular finished aluminum and stainless steel. Comparison tests on several deflection probes which would mechanically transmit deflections of hot specimens. Materials investigated to find a coating for increasing specimen absorption of infrared energy. Specimen cooling methods studied by expanding liquid carbon dioxide through nozzles adjacent to a test specimen. Arc-powered devices for producing high fluxes and temperatures. A plasma jet which will draw either A.C. or D.C. power from ignitron controllers. A plasma jet for heating a leading edge. The two most promising types of high temperature strain gages. (Author)

Descriptors: (*Spacecraft, *High temperature), Heating elements, Infrared equipment, Heat flux, Reflectors, Aluminum, Stainless steel, Gold, Plating, Computer programming, Probes(Electromagnetic), Coatings, Absorption, Cobalt compounds, Carbon dioxide, Atmospheres, Plasma jets, Electric arcs, Cooling, Deflection, Strain gages, Models(Simulations), Model tests, Structural properties, Vacuum apparatus, Control panels

Identifiers: Graphs(Charts), Steel 1050, NTISDODXD

AD-830 530/2ST NTIS Prices: PC$5.50/MF$3.00

Evaluation of Flat-Plate Collector Efficiency under Controlled Conditions in a Solar Simulator

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Johnson, S. M., Simon, F.
D1514L2 Fld: 10B, 97N STAR1502
1976 19p
Rept No: NASA-TM-X-73520, E-8932
Monitor: 18
Conf-Presented at the Intern. Solar Energy Soc. Conf., Winnipeg, Canada, 15-20 Aug. 1976.

Abstract: The measured thermal efficiencies of 35 collectors tested with a solar simulator, along with the correlation equations used to generalize the data, are presented. The single correlation used is shown to apply to all the different types of collectors tested, including one with black paint and one cover, one with a selective surface coating and two covers, and an evacuated-tube collector. The test and correlation technique is also modified by using a shield so that collectors larger than the simulator test area can also be tested. This technique was verified experimentally for a shielded collector for which the collector shielded area was 31% of the solar simulator radiation area. A table lists all the collectors tested, the collector areas, and the experimental constants used to correlate the data for each collector. (Author)

Descriptors: *Solar collectors, *Solar simulators, Energy conversion efficiency, Flat plates, Data correlation, Surface layers, Thermal energy

Identifiers: *Flat plate collectors, Black coatings, Optical coatings, Tests, Performance evaluation, NTISNASA

N77-11530/1ST NTIS Prices: PC$3.50/MF$3.00

Passivation of Pigment Particles for Thermal Control Coatings

Stanford Research Inst., Menlo Park, Calif.

Final Report, Apr. 1974 - Sep. 1975.
Sancier, K. M., Morrison, S. R., Farley, E. P.
D1513A4 Fld: 11C, 22B, 20F, 71E, 46C, 84C, 84G STAR1502
Sep 75 37p
Rept No: NASA-CR-150046
Contract: NAS8-21270
Monitor: 18

Abstract: The preparation of a matrix of 48 samples consisting of pigments and pigmented paints is described. The results obtained from testing these samples by electron spin resonance and by in situ spectral reflectance measurements in space simulation tests are presented. Conclusions and recommendations for further research are given. (Author)

Descriptors: *Paints, *Thermal control coatings, Passivity, Electron paramagnetic resonance, Environmental tests, Space environment simulation

Identifiers: Pigments, Spectral emittance, Optical coatings, Spacecraft, NTISNASA

N77-11174/8ST NTIS Prices: PC$4.00/MF$3.00

Production of High Purity Thermal Control Coatings

Lockheed Missiles and Space CO Palo Alto Calif (210 110)

Final rept. 1 Jun 66-30 Feb 68
Bailin, Lionel J.
D1413F3 Fld: 11C, 22B d7707
Apr 68 200p
Contract: AF 33(615)-5132
Monitor: AFML-TR-68-70
Distribution limitation now removed.

Abstract: Methods, process controls, and equipment have been developed for preparing high purity inorganic-based thermal control coatings for spacecraft. Two pigments, ZrO2.SiO2 and LiAlSiO4, have been synthesized in the laboratory, optimized, and produced in multipound quantities. The effects of ionic impurities, synthesis, and pigment purification parameters on the space radiation stability of the pigments and pigment-potassium silicate binder systems have been studied in detail. Optimization of the pigment-potassium silicate matrix for preparation of gallon quantities has been carried out. Formulation of these quantities is now routine. Application by spray and drawdown techniques for a variety of aluminum and titanium space vehicular shapes and sizes has been successful with no cracking or loss of adhesion. Coating preparation and deposition methods have evolved to produce inorganic coatings of minimal optical and physical changes in laboratory-simulated space radiation and vacuum environments. The potential for effectively coating large and complex shapes and structures with a high degree of reproducibility and reliability has been demonstrated. (Author)

Descriptors: (*Spacecraft, Temperature control), (*Coatings, Production), Pigments, Silicates, Zirconium oxides, Silicon dioxide, Lithium compounds, Aluminum compounds, Synthesis(Chemistry), Optimization, Purification, Impurities, Binders, Potassium compounds, Adhesion, Sprays, Solar radiation, Stability, Doping, Substrates

Identifiers: Lithium aluminosilicates, Potassium silicate, *Protective coatings, *Thermal control coatings, NTISDODXD

AD-830 980/9ST NTIS Prices: PC$7.50/MF$3.00

The Acceptance Tests on the Antenna and Pedestal of the Helios Command Station

European Space Agency, Paris (France).
Sliwinski, P.
D1362C3 Fld: 22D, 9E, 84E, 49A STAR1501
Apr 76 67p
Rept No: ESA-TT-293, DLR-MITT-75-23
Monitor: 18

Tran-Transl. Into English of 'Abnahmemessungen an der Antenne U. Dem Drehstanu der Helios- Kommandostation'. Dfvlr. Oberpfaffenhofen, West Ger. Report Dlr-Mitt-75-23, 14 Nov. 1975. Misc-Original German Report Available from Dfvlr. Cologne Dm 26.

Abstract: The acceptance tests are used to illustrate the complex relationship between the mechanics, control, and steering equipment (drives), and the radiation characteristics of the antenna. Coincidence of the mechanical and electrical axes at an elevation angle of 45 deg is achieved by adjusting the individual elements. The surface roughness of the main dish sets an upper limit to the frequency range. The maximum velocity and acceleration of the pedestal largely determines the field of application for space probes as well as earth satellites. The pointing accuracy and gain of the antenna have to be made compatible. Points which must be considered when preparing the specifications and acceptance tests of large steerable dish antennas are outlined, thus forming a work of reference for project engineers faced with such complex problems. (Author)

Descriptors: *Ground stations, *Helios satellites, *Parabolic antennas, *Supports, Acceptability, Antenna radiation patterns, Command and control, Mechanical drives, Steerable antennas, Surface roughness effects

Identifiers: Translations, West Germany, NTISNASAT

N77-10446/1ST NTIS Prices: PC$4.50/MF$3.00

Environmental Charging Tests of Spacecraft Thermal Control Louvers

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Berkopec, F. D., Stevens, N. J., Schmidt, F. W., Blech, R. A.
D1355F4 Fld: 22B, 84G STAR1501
Sep 76 38p
Rept No: NASA-TM-X-73517, E-8927
Monitor: 18

Abstract: The environmental charging of spacecraft surfaces program consists, in part, of experimental evaluation of material response to the environmental charged particle flux. A flight type spacecraft thermal control louver assembly has been tested in an electron flux. The louver blade surface potential, the louver assembly currents, and the relatively high number of discharges observed in the electron environment are self-consistent results. The unexpected result of this testing was the flutter observed when the louvers were closed. The flutter is about 1 to 2 Hz in frequency and is probably electrostatically induced. (Author)

Descriptors: *Charged particles, *Environmental control, *Louvers, *Spacecraft control, Charging, Flux (Rate), Particle flux density, Thermal control coatings

Identifiers: NTISNASA

N77-10141/8ST NTIS Prices: PC$4.00/MF$3.00

Effects of Vacuum-Ultraviolet Environment on Optical Properties of Bright Anodized Aluminum Temperature Control Coatings

Air Force Materials Lab Wright-Patterson AFB Ohio (012 320)

Rept. for Mar-Sep 67
Weaver, James H.
D1164G4 Fld: 11C, 22B d7705
May 68 32p
Rept No: AFML-TR-67-421
Project: AF-7340
Task: 734007
Monitor: 18
Distribution limitation now removed.

Abstract: No abstract available.

Descriptors: (*Aluminum coatings, *Anodic coatings), Spacecraft, Degradation, Absorption, Emissivity, Optical properties, Space environments, Temperature, Solar radiation, Ultraviolet radiation

Identifiers: Aluminum, Anodic coatings, Graphs(Charts), NTISDODXD

AD-836 534/8ST NTIS Prices: PC$4.00/MF$3.00

Inorganic Thermal Control Coatings

National Aeronautics & Space Administration

Patent
Krupnick, Albert C.
D0852B1 Fld: 90 d7701
Filed 3 Apr 69, patented 16 Nov 71
Rept No: PAT-APPL-813 338
Monitor: 18
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of patent available Commissioner of Patents, Washington, D.C. 20231 $0.50.

Abstract: Inorganic coating compositions are based on a binder obtained by gelling a suspension of synthetic mica or sodium magnesium fluorolithosilicate mineral with a solution of a soluble metal silicate or sulfate. Pigments and other additives are included to provide the desired optical properties. For solar reflector coatings zinc oxide pigment and hollow glass microspheres are employed.

Descriptors: *Patents, *Inorganic, *Thermal, *Control, *Coatings,

Identifiers: PAT-CL-106-288, NTISGPNASA

PATENT-3 620 791 NTIS Prices: Not available NTIS

Solid State Thermal Control Polymer Coating

National Aeronautics & Space Administration

Patent
Pezdirtz, George F.
D0651C2 Fld: 90 d7701
Filed 28 Mar 66, patented 5 Nov 68
Rept No: PAT-APPL-538 907
Monitor: 18
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of patent available Commissioner of Patents, Washington, D.C. 20231 $0.50.

Abstract: A thermosensitive coating for achieving thermal balance in a spacecraft with the coating being a unitary film of a polymer.

Descriptors: *Patents, *Solid, *State, *Thermal, *Control, *Polymer, *Coating,

Identifiers: PAT-CL-244-1, NTISGPNASA

PATENT-3 409 247 NTIS Prices: Not available NTIS

Thermal Control Coating

National Aeronautics & Space Administration

Patent
Wakelyn, Noel T.
D0635D3 Fld: 90 d7701
Filed 17 Nov 64, patented 30 Jul 68
Rept No: PAT-APPL-411 945
Monitor: 18
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of patent available Commissioner of Patents, Washington D.C. 20231 $0.50.

Abstract: A method of improving the optical and thermal control property characteristics of an aluminum surface having a metal phosphate protective coating thereon comprising subjecting the surface coating to a controlled temperature low concentration alkaline solution for a controlled period of time to improve the chemical bond of the coating with the substrate and to reduce the coating weight.

Descriptors: *Patents, *Thermal, *Control, *Coating,

Identifiers: PAT-CL-148-6.16, NTISGPNASA

PATENT-3 395 053 NTIS Prices: Not available NTIS

Durability of Zirconia Thermal-Barrier Ceramic Coatings on Air-Cooled Turbine Blades in Cyclic Jet Engine Operation

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Liebert, C. H., Jacobs, R. E., Stecura, S., Morse, C. R.
D0362C4 Fld: 11B, 11C, 71D, 71E STAR1423
Sep 76 17p
Rept No: NASA-TM-X-3410, E-8700
Monitor: 18

Abstract: Thermal barrier ceramic coatings of stabilized zirconia over a bond coat of Ni Cr Al Y were tested for durability on air cooled turbine rotor blades in a research turbojet engine. Zirconia stabilized with either yttria, magnesia, or calcia was investigated. On the basis of durability and processing cost, the yttria stabilized zirconia was considered the best of the three coatings investigated. (Author)

Descriptors: *Ceramic coatings, *Jet engines, *Turbine blades, Oxides, Thermal control coatings, Yttrium oxides

Identifiers: Zirconium oxides, Magnesium oxides, Calcium oxides, NTISNASA

N76-32192/6ST NTIS Prices: PC$3.50/MF$3.00

Combined Effects of Electron-Solar Radiation

Oklahoma State Univ Stillwater Dept of Mechanical Engineering (267 770)

Final rept. Apr 67-Jun 68
Wiebelt, John A.
D0315L4 Fld: 11C, 11G, 22B d7702
Jan 69 54p
Contract: F33615-67-C-1577
Project: AF-1309
Task: 130908
Monitor: AFFDL-TR-68-122
Distribution limitation now removed.

Abstract: No abstract available.

Descriptors: (*Spacecraft cabins, Temperature control), (*Plastic paints, Thermal insulation), (*Thermal insulation, Environmental tests), (*Pigments, Absorption), Space environments, Electron irradiation, Ultraviolet radiation, Titanium compounds, Dioxides, Degradation, Solar radiation, Silicone plastics

Identifiers: Titanium(Iv) oxide, NTISDODXD

AD-849 949/3ST NTIS Prices: PC$4.50/MF$3.00

Two-Layer Thermal Barrier Coating for Turbine Airfoils - Furnace and Burner Rig Test Results

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Stecura, S.
D0233F2 Fld: 11F, 21E, 81D, 71N STAR1422
Sep 76 20p
Rept No: NASA-TM-X-3425, E-8767
Monitor: 18

Abstract: A simple, two-layer plasma-sprayed thermal barrier coating system was developed which has the potential for protecting high temperature air-cooled gas turbine components. Of those coatings initially examined, the most promising system consisted of a Ni-16Cr-6Al-0.6Y (in wt%) thermal barrier coating (about 0.005 to 0.010 cm thick) and a ZrO2-12Y2O3 (in wt%) thermal barrier coating (about 0.025 to 0.064 cm thick). This thermal barrier substantially lowered the metal temperature of an air-cooled airfoil. The coating withstood 3,200 cycles (80 sec at 1,280 C surface temperature) and 275 cycles (1 hr at 1,490 C surface temperature) without cracking or spalling. No separation of the thermal barrier from the bond coating or the bond coating from the substrate was observed. (Author)

Descriptors: *Airfoils, *Gas turbines, *Thermal control coatings, Protective coatings, Cracking (Fracturing), Spalling, Thermal cycling tests

Identifiers: NTISNASA

N76-31330/3ST NTIS Prices: PC$3.50/MF$3.00

Semiconductor Measurement Technology: Progress Report July 1 to December 31, 1975

National Bureau of Standards, Washington, D.C. Electronic Technology Div.*Defense Advanced Research Projects Agency, Arlington, Va.*Space and Missile Systems Organization, Los Angeles, Calif.*Strategic Systems Project Office (Navy), Crane, Ind.*Defense Nuclear Agency, Washington, D.C. (405 289)
Bullis, W. Murray
D0215B3 Fld: 9A, 20L, 14B, 46D, 49H, 86V GRAI7701
Oct 76 90p
Rept No: NBS-SP-400-25
Contract: ARPA Order-2397
Monitor: 18
Sponsored in part by Space and Missile Systems Organization, Los Angeles, Calif., Strategic Systems Project Office (Navy), Crane, Ind., and Defense Nuclear Agency, Washington, D.C. See also report dated Mar 76, PB-251 349.

Abstract: This progress report describes NBS activities directed toward the development of methods of measurement for semiconductor materials, process control, and devices. Both in-house and contract efforts are included. The emphasis is on silicon device technologies. Principal accomplishments during this reporting period included (1) preliminary results of a systematic study of the effects of surface preparation on spreading resistance measurements; (2) development of an optical test for surface quality of sapphire; (3) development of a basis for an exposure sensitivity specification for photoresists; and (4) development of a modular cell concept for test structure design and layout. Also reported are the results of work on four-probe resistivity measurements, comparison of techniques for surface analysis, ion microprobe mass analysis, redistribution profiles, and thermally stimulated current response of interface states. Supplementary data concerning staff, publications, workshops and symposia, standards committee activities, and technical services are also included.

Descriptors: *Semiconductor devices, *Semiconductors, *Surface properties, *Quality control, *Silicon, Chemical analysis, Semiconductor doping, Defects, Integrated circuits, Measurement, Measuring instruments, Instrumentation, Electrical resistivity, Optical measuring instruments, Mass spectroscopy, Fabrication, Ion implantation, Photolithography, Test facilities, Hermetic seals, Thermal properties, Experimental design

Identifiers: Auger electron spectroscopy, Ion microprobes, Secondary ion mass spectroscopy, Metal oxide semiconductors, NTISCOMNBS, NTISDODA

PB-258 555/2ST NTIS Prices: PC$5.00/MF$3.00

Ceramic Thermal-Barrier Coatings for Cooled Turbines

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Liebert, C. H., Stepka, F. S.
D0083A3 Fld: 21E, 11B, 81D, 71D STAR1421
1976 14p
Rept No: NASA-TM-X-73426, E-8766
Monitor: 18
Conf-Presented at 12TH Propulsion Conf., Palo Alto, Calif., 26-29 Jul. 1976; Sponsored by Aiaa and Sae.

Abstract: Coating systems consisting of a plasma sprayed layer of zirconia stabilized with either yttria, magnesia or calcia over a thin alloy bond coat have been developed, their potential was analyzed and their durability and benefits evaluated in a turbojet engine. The coatings on air cooled rotating blades were in good condition after completing as many as 500 two-minute cycles of engine operation between full power at a gas temperature of 1644 K and flameout, or as much as 150 hours of steady state operation on cooled vanes and blades at gas temperatures as high as 1644 K with 35 start and stop cycles. On the basis of durability and processing cost, the yttria stabilized zirconia was considered the best of the three coatings investigated. (Author)

Descriptors: *Ceramic coatings, *Thermal control coatings, *Turbine engines, Plasma layers, Zirconium oxides, Engine coolants, Magnesium oxides, Metal oxides, Protective coatings, Steady state

Identifiers: NTISNASA

N76-30565/5ST NTIS Prices: PC$3.50/MF$3.00

Space Stable Thermal Control Coatings

IIT Research Inst., Chicago, Ill.
Harada, Y.
D0082B3 Fld: 11C, 13A, 22B, 71E, 84C, 84G STAR1421
26 Jul 76 28p
Rept No: NASA-CR-149978, IITRI-D6118-4(TAR)
Contract: NAS8-31906
Monitor: 18

Abstract: The MOX method, i.e., the use of zinc and titanium oxalate precursors, has the distinct advantages of simple and rapid processing, and of controlled pigment particle size. The chemical identify of TiOX was determined. The Zn/Ti ratio effect on the reflectance spectra and ultraviolet irradiation stability in vacuum for Zn2TiO4 was examined. Optimized processing parameters are considered for reproducibly obtaining a pigment of the most desirable optical properties and behavior. (Author)

Descriptors: *Pigments, *Temperature control, Titanates, Zinc compounds, Heat shielding, Particle size distribution, Protective coatings, Satellite temperature

Identifiers: *Zinc titanates, Spacecraft, Optical coatings, Thermal control coatings, NTISNASA

N76-30372/6ST NTIS Prices: PC$4.00/MF$3.00

Effect of a Surface-to-Gap Temperature Discontinuity on the Heat Transfer to Reusable Surface Insulation Tile Gaps

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Throckmorton, D. A.
C7422D2 Fld: 22B, 20M, 84C STAR1417
Jun 76 35p
Rept No: NASA-TN-D-8233, L-10766
Monitor: 18

Abstract: An experimental investigation is presented that was performed to determine the effect of a surface-to-gap wall temperature discontinuity on the heat transfer within space shuttle, reusable surface insulation, tile gaps submerged in a thick turbulent boundary layer. Heat-transfer measurements were obtained on a flat-plate, single-gap model submerged in a turbulent tunnel wall boundary layer at a nominal free-stream Mach number of 10.3 and free-stream Reynolds numbers per meter of 1.5 million, 3.3 million and 7.8 million. Surface-to-gap wall temperature discontinuities of varying degree were created by heating the surface of the model upstream of the instrumented gap. The sweep angle of the gap was varied between 0 deg and 60 deg; gap width and depth were held constant. A surface-to-gap wall temperature discontinuity (surface temperature greater than gap wall temperature) results in increased heat transfer to the near-surface portion of the gap, as compared with the heat transfer under isothermal conditions, while decreasing the heat transfer to the deeper portions of the gap. The nondimensionalized heat transfer to the near-surface portion of the gap is shown to decrease with increasing Reynolds number; in the deeper portion of the gap, the heat transfer increases with Reynolds number. (Author)

Descriptors: *Reusable heat shielding, *Space shuttles, Gaps, Heat transfer, Temperature effects, Temperature gradients, Thermal insulation, Tiles, Aerodynamic heating, Flat plates, Heat measurement, Reynolds number, Thermal control coatings, Turbulent boundary layer, Wind tunnel models

Identifiers: NTISNASA

N76-26432/4ST NTIS Prices: PC$4.00/MF$3.00

Method of Preparing Zinc Orthotitanate Pigment

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

Patent Application.
Gates, D. W., Harada, Y., Logan, W. R., Gilligan, J. E.
C7421B3 Fld: 11C, 13A, 22B, 71E, 90B, 84G STAR1417
Filed 17 Jun 76 12p
Rept No: PAT-APPL-696 989, NASA-CASE-MFS-23345-1
Contract: NAS8-26791
Monitor: 18
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing Copy of application available NTIS.

Abstract: A method of preparing zinc orthotitanate in a form suitable for use as a pigment in spacecraft thermal control coatings is presented. For optimum reflectance of solar energy a very fine particle size, primarily below one micron, and absence of absorption edge characteristic of uncombined zinc oxide are required. Zinc orthotitanate is prepared by heating a slightly zinc deficient mixture of precipitated zinc oxalate and titanium oxalate. The oxalate mixture, which can be prepared by combining separately precipitated zinc oxalate and titanium oxalate or by co-precipitation of mixed oxalates from chloride solution, is heated to 400 to 600 C to remove volatile decomposition products and is then rapidly heated at 900 to 1,200 C, and preferably at about 1,000 to 1,050 C. Zinc is provided in the reaction mixture in an amount slightly less than the stoichiometric 2:1 zinc-to-titanium molar ratio for formation of orthotitanate so as to avoid the presence in the product pigment of small amounts of zinc oxide.

Descriptors: *Pigments, *Zinc compounds, *Patent applications, Thermal control coatings

Identifiers: Zinc titanates, Optical coatings, Spacecraft, NTISNASA

N76-26285/6ST NTIS Prices: PC$3.50/MF$3.00

Extreme Temperature Thermal Control Coating

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

Patent Application.
Johnson, L. E.
C7421B2 Fld: 11C, 13A, 71E, 90 STAR1417
Filed 21 May 76 6p
Rept No: PAT-APPL-688 879, NASA-CASE-LAR-11756-1
Monitor: 18
Subm-Sponsored by NASA.
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Abstract: A thermal control coating is disclosed which may be applied to a flexible substrate. The coating remains pliant and resistant to abrasion over a wide temperature range.

Descriptors: *Protective coatings, *Thermal insulation, *Patent applications, Flexibility, Heat shielding, Temperature control

Identifiers: NTISNASA

N76-26284/9ST NTIS Prices: PC$3.50/MF$3.00

Metal Pigmented Thermal Control Coatings with High Ratios of Solar Absorptance to Infrared Emittance

Dayton Univ Ohio Research Inst (105 400)

Technical rept. Jan 67-Jan 69
Stevenson, Gary E.
C7313I2 Fld: 11C d7622
Dec 71 45p
Contract: F33615-69-C-1385
Project: AF-7340
Task: 734007
Monitor: AFML-TR-71-248
Distribution limitation now removed.

Abstract: The purpose of the program was to develop sprayable paint-type coatings with variable solar absorptance to infrared emittance ratios greater than unity. Exploratory development on coating materials that will yield a fixed a sub s/epsilon sub N ratio over the range 0.2 < epsilon < 0.50 is described. A variety of leafing metal pigmented coatings was developed and prepared which gave a sub s/epsilon sub N ratios greater than unity. The highest ratios (up to 2.5) were obtained with copper pigmented films after they were oxidized at elevated temperatures. Such specially treated and prepared materials have shown excellent stability to electron and/or ultraviolet irradiation in a simulated space environment and have demonstrated potential for use on future satellite systems. (Author)

Descriptors: (*Paints, Temperature control), Absorption, Infrared radiation, Satellites(Artificial), Coatings, Space environments, Solar radiation, Ultraviolet radiation, Simulation

Identifiers: NTISDODXD

AD-894 544/6ST NTIS Prices: PC$4.00/MF$3.00

Rare Earth Oxide Pigmented Thermal Control Coatings

Air Force Materials Lab Wright-Patterson AFB Ohio (012 320)

Final rept. Aug 69-Oct 70
Prince, Daniel E.
C7312K4 Fld: 11C, 22B d7622
Mar 72 51p
Rept No: AFML-TR-71-246
Project: AF-7340
Task: 734007
Monitor: 18
Distribution limitation now removed.

pigmented polymeric and inorganic coatings having low solar absorptance and high emittance and improved stability to 'space' radiation effects (vacuum, ultraviolet, and particulate radiation) for use in the passive thermal control of spacecraft. Efforts were undertaken to investigate the radiation stability of selected rare earth oxide pigments and pigmented silicone and silicate coatings to a laboratory simulated space environment. Environmental tests of silicone and silicate formulations included exposure to vacuum-ultraviolet, vacuum-electrons, and vacuum-ultraviolet--electrons with both in situ and non-in situ optical reflectance measurements being taken. (Author)

Descriptors: (*Coatings, Temperature control), Rare earth elements, Pigments, Binders, Silicones, Silicates, Space environments, Absorption, Reflectivity, Passive systems, Spacecraft

Identifiers: *Thermal control coatings, NTISDODXD

AD-894 108/0ST NTIS Prices: PC$4.50/MF$3.00

Development of an Improved Coating for Polybenzimidazole Foam

Aerotherm Acurex Corp., Mountain View, Calif.

Final Report.
Neuner, G. J., Delano, C. B.
C7071L3 Fld: 11I, 22B, 71O, 84C, 84G STAR1415
May 76 86p
Rept No: NASA-CR-2697, REPT-75-169
Contract: NAS2-8490
Monitor: 18

Abstract: An improved coating system was developed for Polybenzimidazole (PBI) foam to provide coating stability, ruggedness, moisture resistance, and to satisfy optical property requirements (alpha sub (s/epsilon) or = 0.4 and epsilon 0.8) for the space shuttle. The effort was performed in five tasks: Task 1 to establish material and process specifications for the PBI foam, and material specifications for the coatings; Task 2 to identify and evaluate promising coatings; Task 3 to establish mechanical and thermophysical properties of the tile components; Task 4 to determine by systems analysis the potential weight trade-offs associated with a coated PBI TPS; and Task 5 to establish a preliminary quality assurance program. The coated PBI tile was, through screening tests, determined to satisfy the design objectives with a reduced system weight over the baseline shuttle silica LRSI TPS. The developed tile provides a thermally stable, extremely rugged, low thermal conductivity insulator with a well characterized optical coating. (Author)

Descriptors: *Heat shielding, *Polybenzimidazole, *Space shuttles, *Thermal control coatings, Spacecraft construction materials, Fabrication, Foams, Mechanical properties, Optical properties, Oxidation resistance, Thermophysical properties, Tiles, Weight (Mass)

Identifiers: Thermal insulation, PBI polymers, Heat resistant plastics, NTISNASA

N76-24314/6ST NTIS Prices: PC$5.00/MF$2.25

Thermal Barrier Coating System

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

Patent Application.
Stecura, S., Liebert, C. H.
C6972L2 Fld: 11C, 21E, 71E, 90E, 81D STAR1414
Filed 14 May 76 10p
Rept No: PAT-APPL-686 449, NASA-CASE-LEW-12554-1
Monitor: 18
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Abstract: A coating system is described which contains a bond coating and a thermal barrier coating. It is applied to metal surfaces such as turbine blades and provides both low thermal conductivity and improved adherence when exposed to high temperature gases or liquids. The bond coating contains NiCrAlY and the thermal barrier coating contains a reflective oxide. The reflective oxides ZrO2-Y2O3 and ZrO2-MgO have demonstrated significant utility in high temperature turbine applications.

Descriptors: *Metal surfaces, *Protective coatings, *Thermal control coatings, *Turbine blades, *Patent applications, High temperature fluids, Magnesium oxides, Nickel alloys, Thermal conductivity, Yttrium oxides, Zirconium oxides

Identifiers: Chromium containing alloys, Aluminum containing alloys, Yttrium containing alloys, NTISNASA

N76-23359/2ST NTIS Prices: PC$3.50/MF$2.25

Simulated Lightning Test Shuttle .03 Scale Model

McDonnell Aircraft Co., St. Louis, Mo.

Final Report.
Clifford, D. W.
C6905E2 Fld: 22A, 22D, 84A, 84E STAR1413
11 Dec 74 68p
Rept No: NASA-CR-147671, MDC-A3155
Contract: NAS9-19370
Monitor: 18

Abstract: Lightning Attach Point tests were conducted for the space shuttle launch configuration (Orbiter, External Tank and Solid Rocket Boosters). A series of 250 long spark tests (15 to 20 foot sparks) determined that the orbiter may be struck on the nose, windshield brow, tail and wingtips during launch but not on the main engine nozzles which have been shown to be vulnerable to lightning damage. The orbiter main engine and SRB exhaust plumes were simulated electrically with physical models coated with graded resistance paints. The tests showed that the exhaust plumes from the SRB provide additional protection for the main engine nozzles. However, the tests showed that the Orbiter Thermal Protection System (TPS), which has also been shown to be vulnerable to lightning damage, may be struck during launch. Therefore further work is indicated in the areas of swept stroke studies on the model and on TPS panels. Further attach point testing is also indicated on the free-flying orbiter. Photographs of the test setup are shown. (Author)

Descriptors: *Lightning, *Scale models, *Simulation, *Space shuttle orbiters, Atmospheric electricity, Booster rocket engines, Electric sparks, Exhaust gases, External tanks, Space shuttle boosters, Thermal control coatings, Thermal protection

Identifiers: NTISNASA

N76-22275/1ST NTIS Prices: PC$4.50/MF$2.25

Standardized Performance Tests of Collectors of Solar Thermal Energy: A Selectively Coated, Steel Collector with One Transparent Cover

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
C6495G2 Fld: 10A, 97D STAR1408
Jan 76 7p
Rept No: NASA-TM-X-71870, E-8641
Monitor: 18

Abstract: Basic test results are presented of a flat-plate solar collector whose performance was determined in solar simulator. The collector was tested over ranges of inlet temperatures, fluxes and coolant flow rates. Collector efficiency was correlated in terms of inlet temperature and flux level. (Author)

Descriptors: *Amorphous materials, *Solar energy absorbers, *Steel structures, *Thermal control coatings, *Solar collectors, Performance tests, Standardization, Flux (Rate), Heat flux, Solar flux, Solar simulators, Surface cooling, Temperature profiles, Thermal absorption

Identifiers: *Flat plate collectors, Thermal efficiency, NTISNASA

N76-17643/7ST NTIS Prices: PC$3.50/MF$2.25

The Effects of Solid Rocket Motor Effluents on Selected Surfaces and Solid Particle Size, Distribution, and Composition for Simulated Shuttle Booster Separation Motors

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Jex, D. W., Linton, R. C., Russell, W. M., Trenkle, J. J., Wilkes, D. R.
C6395L1 Fld: 21H, 81K, 84C STAR1407
12 Jan 76 218p
Rept No: NASA-TM-X-64975
Monitor: 18

Abstract: A series of three tests was conducted using solid rocket propellants to determine the effects a solid rocket plume would have on thermal protective surfaces (TPS). The surfaces tested were those which are baselined for the shuttle vehicle. The propellants used were to simulate the separation solid rocket motors (SSRM) that separate the solid rocket boosters (SRB) from the shuttle launch vehicle. Data cover: (1) the optical effects of the plume environment on spacecraft related surfaces, and (2) the solid particle size, distribution, and composition at TPS sample locations.

Descriptors: *Plumes, *Solid rocket propellants, *Space shuttles, *Surface reactions, *Thermal control coatings, Composition (Property), Materials tests, Particle size distribution, Protective coatings

Identifiers: NTISNASA

N76-16169/4ST NTIS Prices: PC$7.75/MF$2.25

Eighth Conference of Space Simulation

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
C6023J2 Fld: 14B, 22A, 73D, 84A STAR1402
1975 859p
Rept No: NASA-SP-379
Monitor: 18
Conf-Conf. Held at Silver Spring, MD., 3-5 Nov. 1975; Sponsored by Inst. Of Environ. Sci., Aiaa, Astm, and NASA.

Abstract: Papers are presented on the state-of-the-art in space simulation, spacecraft contamination, thermal control systems, biosciences, and flammability.

Descriptors: *Conferences, *Space environment simulation, *Spacecraft contamination, Exobiology, Flammability, Solar simulators, Temperature control, Thermal control coatings, Vacuum chambers

Identifiers: NTISNASA

N76-11113/7ST NTIS Prices: PC$21.25/MF$2.25

Effects of High Energy Simulated Space Radiation on Polymeric Second-Surface Mirrors

Boeing Aerospace Co., Seattle, Wash.

Final Report, Aug. 1974 - Oct. 1975.
Eogdall, L. B., Cannaday, S. S.
C5763E4 Fld: 03B, 54C STAR1401
Oct 75 165p
Rept No: NASA-CR-132725, D180-18014-2
Contract: NAS1-13530
Monitor: 18

Abstract: A radiation effects experimental program was performed, in which second surface mirror type thermal control coatings were exposed to ultraviolet radiation, electrons, and protons simultaneously. Stability was assessed by making periodic spectral reflectance measurements in situ (and in air after testing for comparison). Solar absorption coefficients were derived by computer. Many of the exposed materials showed large amounts of degradation in reflectance absorptance, principally due to the electron exposure. A series of tests was conducted, leading to the identification of a modified second surface mirror that shows considerable improvement and promise for stability during thermal control applications in a charged particle space radiation environment. (Author)

Descriptors: *Mirrors, *Performance tests, *Radiation effects, *Solar simulation, *Thermal control coatings, Electron radiation, Graphs (Charts), Protective coatings, Proton irradiation, Reflectance, Spacecraft structures, Ultraviolet radiation

Identifiers: NTISNASA

N76-10978/4ST NTIS Prices: PC$6.75/MF$2.25

Lubricant Reservoir Systems: Thermal Considerations

Aerospace Corp El Segundo Calif Chemistry and Physics Lab*Space and Missile Systems Organization, Los Angeles Air Force Station, Calif. (409383)

Interim rept.
Dormant, Leon M., Feuerstein, Seymour
C5591G2 Fld: 13K, 20M, 99F, 72K GRAI7601
9 Oct 75 18p
Rept No: TR-0076(6270-30)-1
Contract: F04701-75-C-0076
Monitor: SAMSO-TR-75-239

Abstract: The thermal conditions necessary to ensure that porous nylon lubricant reservoirs properly function as lubricant replenishment sources are derived by thermocynamic methodology. The porous nylon must be warmer than its surroundings by at least an amount delta T, which may be expressed by the relation delta T=-2 gamma V T sub B rH where T sub B is the system temperature, r is the nylon pore radius, and gamma, V, and H are the surface tension, the molar volume, and the molar heat of vaporization of the liquid lubricant, respectively.

Descriptors: *Oil reservoirs, *Lubricants, *Reservoirs, *Bearings, Thermodynamics, Lubrication, Replenishment, Nylon, Capillarity, Transport properties, Temperature control, Gradients, Heat, Methodology, Porous materials, Surface properties, Surface temperature, Interfacial tension, Heat of vaporization, Spacecraft, Spaceborne, Feeding, Surfaces, Pressure, Mechanical components, LaPlace transformation, Temperature

Identifiers: Kelvin equation, NTISDODXA, NTISDODAF

AD-A017 502/6ST NTIS Prices: PC$3.50/MF$2.25

Materials Data Retrieval at Estec

European Space Research and Technology Center, Noordwijk (Netherlands).
Dauphin, J., Ryden, B.
C5565H4 Fld: 22B, 09B, 71, 88B STAR1322
Apr 75 32p
Rept No: ESRO-TN-120-ESTEC
Monitor: 18

Abstract: An interaction data retrieval system allowing the selection of suitable materials for spacecraft applications is described. Main points considered in data entry of thin materials are vacuum, radiation, and thermal effects. The materials are identified by trade name and number, manufacturer's name, type of product, and chemical nature. Micro-VCM (outgassing) data and thermo-optical properties were stored as selection criteria. Materials properties were extracted from open literature, unpublished American sources, internal ESRO documents, and ESRO contractor reports. The documents are available in microfiche. Examples of interaction dial-up searches are given, and costs involved are discussed.

Descriptors: *Data retrieval, *European space programs, *Spacecraft construction materials, Chemical properties, Outgassing, Quality control, Radiation effects, Remote consoles, Temperature effects, Thermal control coatings, Vacuum effects

Identifiers: NTISNASAE

N75-31941/8ST NTIS Prices: PC$3.75/MF$2.25

Lightweight Thermally Efficient Composite Feedlines for the Space Tug Cryogenic Propulsion System

Martin Marietta Corp., Denver, Colo.

Final Report, Aug. 1973 - May 1975.
Spond, D. E.
C5475E1 Fld: 22B, 84C STAR1321
Aug 75 127p
Rept No: NASA-CR-134870, REPT-04236
Contract: NAS3-17796
Monitor: 18

Abstract: Six liquid hydrogen feedline design concepts were developed for the cryogenic space tug. The feedlines include composite and all-metal vacuum jacketed and nonvacuum jacketed concepts, and incorporate the latest technological developments in the areas of thermally efficient vacuum jacket end closures and standoffs, radiation shields in the vacuum annulus, thermal coatings, and lightweight dissimilar metal flanged joints. The feedline design concepts are evaluated on the basis of thermal performance, weight, cost, reliability, and reusability. Design concepts were proved in a subscale test program. Detail design was completed on the most promising composite feedline concept and an all-metal feedline. Three full scale curved composite feedlines and one all-metal feedline assembly were fabricated and subjected to a test program representative of flight hardware qualification. The test results show that composite feedline technology is fully developed. Composite feedlines are ready for space vehicle application and offer significant reduction in weights over the conventional all-metal feedlines presently used. (Author)

Descriptors: *Cryogenic rocket propellants, *Feed systems, *Space tugs, *Spacecraft propulsion, Cost analysis, Design analysis, Performance prediction, Propulsion system performance, Storable propellants, Thermal control coatings

Identifiers: NTISNASA

N75-30245/5ST NTIS Prices: PC$5.75/MF$2.25

Particulate and Solar Radiation Stable Coating for Spacecraft

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

Patent Application.
Slemp, W. S.
C5403G2 Fld: 11C, 90B, 71E STAR1320
Filed 16 May 75 8p
Rept No: PAT-APPL-578 240, NASA-CASE-LAR-10805-2
Monitor: 18
Government-owned invention available for licensing. Copy of application available NTIS.

Abstract: A laminate thermal control coating for spacecraft comprised of a layer of solar radiation stable film, a layer of particulate radiation stable film applied to the upper surface of the solar radiation stable film, and a layer of reflecting material applied to the lower surface of the solar radiation stable film is proposed. The coating experiences no increase in solar radiation absorbtance upon exposure to particulate or solar radiation as the particulate radiation is substantially absorbed in the particulate radiation stable layer. The solar radiation partially absorbed by the particulate radiation stable layer is transmitted by the solar radiation stable film to the reflecting material which reflects it back through the laminate and into space.

Descriptors: *Solar radiation, *Spacecraft design, *Thermal control coatings, *Patent applications, Absorption, Laminates

Identifiers: NTISNASA

N75-29431/4ST NTIS Prices: PC$3.25/MF$2.25

Refractory Porcelain Enamel Passive Control Coating for High Temperature Alloys

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

Patent.
Levin, H., Auker, B. H., Gardos, M. N.
C5265K1 Fld: 11C, 90B, 71E STAR1318
Patented 24 Jun 75 5p
Rept No: PATENT-3 891 452, PAT-APPL-350 250
Monitor: 18
Misc-Filed 11 Apr. 1973 Supersedes N73-21471 (11 - 12, p 1416). Subm-Sponsored by NASA.
Government-owned invention available for licensing. Copy of patent available from Commissioner of Patents, Washington, D.C. 20231 $.50.

Abstract: Porcelain enamel for use as a thermal control coating on high-temperature, nonferrous superalloy substrates is described. It is made up of a high-refractory-content boroaluminum silicate glass frit containing zirconium oxide, lithium fluoride, alkali metal and alkaline earth oxide-flux, zinc oxide, and a submicron disperse phase of cubic-stabilizec zirconium oxide. The coatings exhibit favorable optical properties and a high coefficient of thermal expansion, providing compatibility with substrates of nonferrous superalloys and enabling coated parts of such alloys to withstand severe thermal cycling conditions without cracking.

Descriptors: *Enamels, *Heat resistant alloys, *Porcelain, *Thermal control coatings, *Patents, Nonferrous metals, Optical properties, Performance prediction, Thermal expansion

Identifiers: PAT-CL-106-48, NTISNASA

N75-27160/1ST NTIS Price: Not available NTIS

Solar Electric Propulsion System Thermal Analysis

Rockwell International Corp., Downey, Calif. Space Div.

Final Report, 27 Dec. 1973 - 27 Feb. 1975.
C5115J2 Fld: 21C, 81B STAR1316
28 Feb 75 193p
Rept No: NASA-CR-120770, SD-75-SA-0012
Contract: NAS8-30542
Monitor: 18

Abstract: Thermal control elements applicable to the solar electric propulsion stage are discussed along with thermal control concepts. Boundary conditions are defined, and a thermal analysis was conducted with special emphasis on the power processor and equipment compartment thermal control system. Conclusions and recommendations are included. (Author)

Descriptors: *Heat pipes, *Multilayer insulation, *Solar electric propulsion, *Thermal control coatings, Graphs (Charts), Louvers, Product development, Solar heating, Tables (Data), Thermal environments

Identifiers: NTISNASA

N75-24842/7ST NTIS Prices: PC$7.00/MF$2.25

Perfection of a Quartz Monitor. A Carousal System for Semiindustrial Production of Uniform Thin Films: Application to D5a Solar Absorbers Mise au Point d'UN Ensemble Balance a Quartz. Systeme a Carrousel pour la Fabrication Semiindustrielle de Couches Minces Uniformes: Application a D5a - Absorbeurs Solaires

Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.
Soulet, M.
C4932J2 Fld: 14B STAR1314
Nov 74 19p
Rept No: ONERA-DERTS-NT-04-3
Monitor: 18
Language in French.

Abstract: A quartz oscillator monitored device is presented for semi-industrial production of vacuum deposited, uniform thin films to be used as solar energy absorbers for thermal control of the Frech D5A satellite. The existing equipment is reviewed and laboratory tests discussed with regard to adhesion, absorptance, and emission properties of the films made of Cr, Au, Al, SiO. The proposed improvements provide for enhanced reproducibility and homogenity. The carousel device used for that purpose is described together with ancillary equipment. The calibrating procedure is detailed, and the final set up for the D5A satellite panels is presented.

Descriptors: *Production engineering, *Quartz crystals, *Solar energy absorbers, *Thermal control coatings, *Thin films, Adhesion, Film thickness, French satellites, Frequency shift, Homogeneity, Optical thickness, Reproduction, Vacuum deposition

Identifiers: NTISNASA

N75-23355/1ST NTIS Prices: PC$3.25/MF$2.25

Use of Thin Films for an Especially Hot in Space Satellite Coating Named Solar Absorber Application des Couches Minces a UN Type de Revetement pour Satellite, Particulierement Chaud dans l'Espace, Appele Absorbeur Solaire

Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.
Riboulet, M.
C4925D3 Fld: 22B STAR1314
Nov 74 13p
Rept No: ONERA-DERTS-NT-04-4
Monitor: 18
Language in French.

Abstract: The various methods used for satellite thermal control by solar energy absorbers are reviewed, and a short bibliography is provided. In view of the high absorptance/emittance ratios required for the French D5A satellite, the Koltun method is favored. Theoretical considerations make it possible to determine the cptimal thicknesses for a double layer under normal incidence with regard to mechanical constraints required for the specific application considered. The constraints are detailed and leac to a 0.5 mm thick polished Al substrate, a NiCr (20-80), 150 Angstrom thick first layer, and an SiO, 800 Angstrom thick interferential layer. The production engineering procedures are detailed.

Descriptors: *French satellites, *Production engineering, *Solar energy absorbers, *Thermal control coatings, *Thin films, Environmental tests, Film thickness, Nondestructive tests, Vacuum deposition

Identifiers: NTISNASA

N75-22760/3ST NTIS Prices: PC$3.25/MF$2.25

Phase Change Paint Tests to Investigate Effects of Tps Tiles on Heating Rates of the Rockwell Space Shuttle Orbiter (Test Oh4c, Model 21-0)

Chrysler Corp., New Orleans, La.

Aerothermodynamic Data Report.
Quan, M.
C4682E3 Fld: 22B, 84C STAR1310
Feb 75 278p
Rept No: NASA-CR-141505, DMS-DR-2225
Contract: NAS9-13247
Monitor: 18

Abstract: Information and data from wind tunnel tests conducted on 0.0175-scale models of the space shuttle orbiter are presented. The primary objective of the tests was to evaluate aerodynamic heating effects of the tiles in the thermal protection system (TPS). Tile gap depth and flow orientation effects on the TPS were investigated. Tile patterns were cut into the undersides of the orbiter models to simulate the gaps. One model was left smooth for comparison. (Author)

Descriptors: *Space shuttle orbiters, *Thermal control coatings, *Wind tunnel models, *Wind tunnel tests, Aerodynamic heating, Materials tests, Spacecraft components, Thermodynamic properties

Identifiers: NTISNASA

N75-18297/2ST NTIS Prices: PC$8.75/MF$2.25

Optical Effect of the Contamination of Infrared Windows by the Outgassing of Materials in Outer Space

Fisk Univ., Nashville, Tenn.

Semiannual Status Report, period ending 1 Jan. 1975.
Silberman, E.
C4675E3 Fld: 20F, 46C, 71E STAR1309
1 Jan 75 5p
Rept No: NASA-CR-142074
Contract: NGR-43-021-002
Monitor: 18

Abstract: The composition and evaporation rate of the outgassing of a space vehicle thermal control paint as a function of temperature were studied. A contamination chamber was designed, constructed, and tested. Samples of thermal control paint were tested to determine if heating to moderate temperatures causes them to release outgassing products which can be collected on a cooled cesium iodide window for identification by IR analysis. Results showed that outgassing of surfaces other than the sample was a problem. Spectral bands of the deposits collected were compared.

Descriptors: *Aerospace environments, *Outgassing, *Thermal control coatings, Absorption spectroscopy, Infrarec spectroscopy, Spectral bands, Temperature effects

Identifiers: NTISNASA

N75-18047/1ST NTIS Prices: PC$3.25/MF$2.25

Thermal Control Coating Absorptance Measurement Methods

Office National d'Etudes et de Recherches Aerospatiales; Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.

Final Report.
C4535G2 Fld: 11C STAR1308
Nov 73 114p
Rept No: ONERA-DERTS-CR-03-79-REP, ESRO-CR(P)-433
Contract: ESTEC-1440/71-HP
Monitor: 18
Language in French.

Abstract: Two methods for thermal control coating absorptance measurement were evaluated: the first by Peltier effect, the second by measuring total hemispheric reflectance of samples by means of an integrating sphere. Both methods were developed, and their experimental apparatus and its performance are described and results given. The ultraviolet irradiation apparatus, for vacuum testing of the coatings anc its performance is also described.

Descriptors: *Absorptance, *Peltier effects, *Reflectance, *Thermal control coatings, *Ultraviolet radiation, Test facilities, Thermocouples, Vacuum tests

Identifiers: NTISNASA

N75-16861/7ST NTIS Prices: PC$5.25/MF$2.25

Lightweight Electrically Powered Flexible Thermal Laminate

National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

Patent Application.
Dawn, F. S., Sauers, D. G.
C4533F3 Fld: 13A, 90 STAR1306
Filed 14 Jan 75 8p
Rept No: PAT-APPL-540 779, NASA-CASE-MSC-12662-1
Monitor: 18
Government-owned invention available for licensing. Copy of application available NTIS.

Abstract: A lightweight flexible laminate structure for providing controlled heating is described. It is composed of filling yarns and warp-yarns which are preferably interwoven. The filling strands are electrically nonconductive multifilament yarns, and the warp-yarns are composed of electrically conductive metal filaments or fibers which can be resistance heated by the application of an electrical voltage. The nonconductive yarns provide mechanical strength and preclude the passage of electrical current between metal yarns by assuring minimum spacing. A plastic film is bonded to the matrix of the yarns and performs the function of providing additional strength and preventing connective loss of heat in a nonvacuum application. A metallic film of aluminum, silver, or gold is deposited on the obverse side of the film relative to the matrix and provides uniform heat load distribution. (Author)

Descriptors: *Electrical resistivity, *Laminates, *Metal fibers, *Thermal control coatings, *Patent applications, Conductive heat transfer, Electric potential, Flexibility, Resistance heating, Yarns

Identifiers: NTISNASA

N75-16636/5ST NTIS Prices: PC$3.25/MF$2.25

Surface Heat Transfer Coefficients of Pin-Finned Cylinders

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Vanfossen, G. J. Jr
C4402J2 Fld: 20M, 46 STAR1306
Jan 75 26p
Rept No: NASA-TM-X-3173, E-8125
Monitor: 18
Subm-Prepared in Cooperation with Army Air Mobility R and D Lab., Cleveland.

Abstract: An experimental investigation was conducted to measure heat-transfer coefficients for a 15.24-centimeter-diameter cylinder with pin fins on its surface. Pin diameters of 0.3175 and 0.6350 centimeter with staggered pin spacings of 3 and 4 pin diameters and pin lengths of 5, 7, and 9 pin diameters were tested. Flow was normal to the axis of the cylinder, and local heat-transfer coefficients were measured as a function of angle around the circumference of the cylinder. The average heat-transfer coefficient was also computed. Reynolds number based on pin diameter ranged from 3600 to 27,750. The smallest diameter, closest spacing, and largest pin-length-to-diameter ratio gave the highest average effective heat-transfer coefficients. (Author)

Descriptors: *Cylindrical bodies, *Fins, *Heat transfer coefficients, *Pins, Flow characteristics, Gauss equation, Remote control, Reynolds number, Television cameras

Identifiers: NTISNASA

N75-14990/8ST NTIS Prices: PC$3.75/MF$2.25

Definition of Thermal Control Surface Characteristics of Satellite Model C

Aerospace Corp El Segundo Calif Engineering Science Operations*Space and Missile Systems Organization, Los Angeles, Calif. (404068)

Final rept.
Donabedian, Martin
C4144B1 Fld: 22B, 17E, 84G, 63C GRAI7506
13 Jan 75 47p
Rept No: TR-0075(5484)-1
Contract: F04701-74-C-0075
Monitor: SAMSO-TR-75-29

Abstract: Basic vehicle geometry, surface areas and thermal control surface characteristics and internal heat generation rates for the ERTS-1 were defined to permit generation of the infrared signature of the satellite under anticipated orbital conditions and operating modes. The ERTS-1, which operates in a 500 nmi altitude circular sun-synchronous polar orbit, uses both passive and active thermal control systems. Passive control is accomplished by the use of thermal control coatings (various white and aluminum paints) and insulation. Active control employs temperature-activated movable shutters to maintain the bulk of the electronic equipment between 17C (63F) and 25C (77F). Orbital temperature data are provided for some portions of the spacecraft.

Descriptors: *Scientific satellites, *Infrared signatures, Infrared detection, Thermal analysis, Thermal radiation, Thermophysical properties, Temperature control

Identifiers: ERTS-1 satellite, Thermal dissipation, NTISDODAF

AD/A-004 081/6ST NTIS Prices: PC$3.75/MF$2.25

Optical Interactions in Solids Relating to Solid State Detectors and Corrosion Control

Georgia Inst of Tech Atlanta School of Physics*Air Force Office of Scientific Research, Arlington, Va. (404227)

Final rept.
Stevenson, James R.
C4132A4 Fld: 20F, 11F, 46C, 71G GRAI7506
Nov 74 11p
Grant: AF-AFOSR-1892-70
Project: AF-9763
Task: 976301
Monitor: AFOSR-TR-74-1920

Abstract: The optical properties of cadmium arsenide, cadmium phosphide alloys are reported. The infrared characteristics of synchrotron radiation as a possible source for infrared spectroscopy and detector calibration have been studied. The relation of the extreme ultraviolet reflectance to the optical constants generated by a Kramers-Kronig analysis with applications to the cadmium-zinc-arsenide alloy are reported. The results of Auger electron spectroscopy and optical spectroscopy of magnesium-magnesium oxide surfaces are given with possible applications to corrosion studies and optical characterization of surfaces.

Descriptors: *Semiconductors, *Infrared optical materials, *Surface properties, *Corrosion, Scientific research, Optical properties, Cadmium compounds, Arsenides, Phosphides, Zinc compounds, Auger electron spectroscopy, Vacuum ultraviolet radiation, Magnesium, Synchrotrons, Infrared radiation

Identifiers: Cadmium arsenides, Cadmium phosphides, Zinc arsenides, NTISDODAF

AD/A-003 743/2ST NTIS Prices: PC$3.25/MF$2.25

Solar Heating and Cooling of Buildings Study Conducted for Department of the Army. Volume II. Technical Report

General Electric Co Philadelphia Pa Space Div*Army Construction Engineering Research Lab., Champaign, Ill. (405025)
C4024A1 Fld: 13A, 10B, 97C, 89B GRAI7504
Jun 74 597
Rept No: 74SD4226-Vol-2
Monitor: CERL-TR-E-65-Vol-2
See also Volume 1, AD/A-002 576.

Abstract: A study of the use of solar energy for the heating and cooling of buildings at Army installations was conducted with two principal objectives: (1) the preliminary design of a solar heating system for retrofitting on an existing building and (2) the evaluation of solar system concepts for the combined heating and cooling of a building in the construction planning phase. A two story administration building at Fort Belvoir, Virginia was selected for the retrofit heating only application and a single story classroom building planned for Fort Huachuca, Arizona was selected for the evaluation of combined solar heating and cooling system concepts. In both applications, the solar energy was absorbed by roof mounted, flat-plate collectors, heating a circulating water flow which was collected in large thermal storage tanks until needed. Assessments were made of the principal technologies associated with solar collectors, thermal energy storage, and cooling by means of solar energy. Implementation plans for follow-on phases describing further design activities, schedules, and cost estimates are provided for both the Fort Belvoir and Fort Huachuca Buildings.

Descriptors: *Solar collectors, *Solar heating, *Buildings, Storage, Exchange, Air conditioning equipment, Pumping, Absorbers(Materials), Insulation, Feasibility studies, Cost estimates, Drawings, Bromides, Buildings, Control systems, Structural properties, Computerized simulation, Site selection , Systems engineering

Identifiers: Heat exchangers, Heat storage, *Solar air conditioning, Solar space heating, Heat pumps, Solar energy absorbers, Antireflection coatings, Design, Lithium bromide, Fort Belvoir, Fort Huachuca, NTISDODA

AD/A-002 563/5ST NTIS Prices: PC$13.25/MF$2.25

Evaluation of Coated Columbium Alloy Heat Shields for Space Shuttle Thermal Protection System Application. Volume 3, Phase 3: Full Size Tps Evaluation

General Dynamics/Convair, San Diego, Calif,

Technical Report, Feb. 1973 - Mar. 1974.

Baer, J. W., Black, W. E.
C4012A4 Fld: 22B, 84C STAR1224
Apr 74 162p
Rept No: NASA-CR-112119-3
Contract: NAS1-9793
Monitor: 18

Abstract: The thermal protection system (TPS), designed for incorporation with space shuttle orbiter systems, consists of one primary heat shield thermally and structurally isolated from the test fixture by eight peripheral guard panels, all encompassing an area of approximately 12 sq ft. TPS components include tee-stiffened Cb 752/R-512E heat shields, bi-metallic support posts, panel retainers, and high temperature insulation blankets. The vehicle primary structure was simulated by a titanium skin, frames, and stiffeners. Test procedures, manufacturing processes, and methods of analysis are fully documented. For Vol. 1, see N72-30948; for Vol. 2, see N74-15660. (Author)

Descriptors: *Heat shielding, *Niobium alloys, *Space shuttle orbiters, *Thermal protection, Manufacturing, Panels, Skin (Structural member), Stiffening, Supports, T shape, Thermal control coatings, Thermal insulation, Titanium

Identifiers: NTISNASA

N74-35278/2ST NTIS Prices: PC$6.25/MF$2.25

A Study of Rsi under Combined Stresses

Materials Sciences Corp., Blue Bell, Pa.
Kibler, J. J., Rosen, B. W.
C4005B4 Fld: 11G, 71M STAR1224
Sep 74 68p
Rept No: NASA-CR-132507, TFR/1024/7408
Contract: NAS1-12967
Monitor: 18

Abstract: The behavior of typical rigidized surface insulation material (RSI) under combined loading states was investigated. In particular, the thermal stress states induced during reentry of the space shuttle were of prime concern. A typical RSI tile was analyzed for reentry thermal stresses under computed thermal gradients for a model of the RSI material. The results of the thermal stress analyses were then used to aid in defining typical combined stress states for the failure analysis of RSI. (Author)

Descriptors: *Insulation, *Mechanical properties, *Thermal stresses, Reentry, Space shuttles, Stress analysis, Temperature gradients, Thermal control coatings

Identifiers: NTISNASA

N74-34959/8ST NTIS Prices: PC$4.25/MF$2.25

Shuttle Active Thermal Control System Development Testing. Volume 7: Improved Radiator Coating Adhesive Tests

LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
Reed, M. W.
C3951G3 Fld: 22B, 84C STAR1223
16 Nov 73 64p
Rept No: NASA-CR-140274, T169-28-VOL-7
Contract: NAS9-10534
Monitor: 18
Seri-8.

Abstract: Silver/Teflon thermal control coatings have been tested on a modular radiator system projected for use on the space shuttle. Seven candidate adhesives have been evaluated in a thermal vacuum test on radiator panels similar to the anticipated flight hardware configuration. Several classes of adhesives based on polyester, silicone, and urethane resin systems were tested. These included contact adhesives, heat cured adhesives, heat and pressure cured adhesives, pressure sensitive adhesives, and two part paint on or spray on adhesives. The coatings attached with four of the adhesives, two silicones and two urethanes, had no changes develop during the thermal vacuum test. The two silicone adhesives, both of which were applied to the silver/Teflon as transfer laminates to form a tape, offered the most promise based on application process and thermal performance. Each of the successful silicone adhesives required a heat and pressure cure to adhere during the cryogenic temperature excursion of the thermal-vacuum test. (Author)

Descriptors: *Adhesives, *Space shuttles, *Thermal control coatings, Heat radiators, Silicones, Silver, Teflon (Trademark), Thermal vacuum tests, Urethanes

Identifiers: NTISNASA

N74-34347/6SL NTIS Prices: PC$4.25/MF$2.25

Shuttle Active Thermal Control System Development Testing. Volume 2: Modular Radiator System Tests

LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
Scheps, P. B., Howell, H. R., Voss, F. E.
C3951F1 Fld: 22B, 84C STAR1223
23 Oct 73 212p
Rept No: NASA-CR-140268, T169-28-VOL-2
Contract: NAS9-10534
Monitor: 18
Seri-8.

Abstract: Tests were designed to investigate the validity of the modular approach to space radiator system design for space shuttle and future applications by gathering performance data on various systems comprised of different numbers of identical panels, subject to nominal and extreme heat loads and environments. Both one-sided and two-sided radiation was tested, and engineering data was gathered on simulated low a/e coatings and system response to changes in outlet temperature control point. The results of the testing showed system stability throughout nominal orbital transients, unrealistically skewed environments, freeze-thaw transients, and rapid changes in outlet temperature control point. Various alternative panel plumbing arrangements were tested with no significant changes in performance being observed. With the MRS panels arranged to represent the shuttle baseline system, a maximum heat rejection of 76,600 Btu/hr was obtained in segmented tests under the expected worst case design environments. Testing of an alternate smaller two-sided radiation configuration yielded a maximum heat rejection of 52,931 Btu/hr under the maximum design environments. (Author)

Descriptors: *Cooling systems, *Heat radiators, *Space shuttles, Environmental tests, Heat transfer, Thermal control coatings

Identifiers: NTISNASA

N74-34341/9SL NTIS Prices: PC$7.25/MF$2.25

Shuttle Active Thermal Control System Development Testing. Volume 1: Overall Summary

LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
Howell, H. R.
C3951E4 Fld: 22B, 84C STAR1223
8 Apr 74 108p
Rept No: NASA-CR-140267, T169-28-VOL-1
Contract: NAS9-10534
Monitor: 18

Abstract: A summary is given of a series of thermal vacuum tests designed to support the development of the orbiter active thermal control system (ATCS) and included testing of a wide heat load range modular radiator system (MRS) configured to the March 1973 orbiter baseline system, a candidate weight reducing radiator/water cooling system, and a smaller radiator system with a high performance radiator coating. The tests verified the performance of the baseline system and obtained detailed design information for application of a wide heat load range modular radiator system to the orbiter. The two candidate ATCS weight reducing designs have undergone extensive concept verification testing and their system operating characteristics have been determined in sufficient detail for application to the orbiter. Design information has been obtained for an integrated radiator/water cooling system that provides for vehicle heat rejection as well as water management of the excess fuel cell water. Processing techniques have been developed and verified for the application of a high performance thermal control coating to large radiator areas subjected to a temperature range of -280 F to +160 F. (Author)

Descriptors: *Space shuttle orbiters, *Temperature control, *Thermal vacuum tests, Cooling systems, Heat radiators, Thermal control coatings, Water

Identifiers: NTISNASA

N74-34340/1SL NTIS Prices: PC$5.25/MF$2.25

Improved Coating for Silica Fiber Based Ceramic Reusable Surface Insulation (Crsi)

General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.

Contractor Report, 1 Jul. - 31 Dec. 1973.
Ormiston, T. J.
C3641H2 Fld: 11C, 71E STAR1219
Apr 74 102p
Rept No: NASA-CR-134653
Contract: NAS3-17793
Monitor: 18

Abstract: A series of coatings was developed for the space shuttle type silica fiber insulation system and characterizec for optical and physical properties. Reentry simulation tests were run using a radiant panel and also using a hypersonic plasma arc. The coatings produced had improved physical and optical properties as well as greater reuse capability over the GE version of the JSC-0042 coating. (Author)

Descriptors: *Ceramics, *Glass fibers, *Silicon dioxide, *Thermal control coatings, Aerodynamic heating, Protective coatings, Reentry, Space shuttles

Identifiers: NTISNASA

N74-30006/2SL NTIS Prices: PC$8.25/MF$2.25

Data Correlation and Analysis of Arc Tunnel and Wind Tunnel Tests of Rsi Joints and Gaps. Volume 2: Data Base

McDonnell-Douglas Astronautics Co., St. Louis, Mo.

Final Report, 16 May 1973 - 31 Jan. 1974.
Christensen, H. E., Kipp, H. W.
C3515D3 Fld: 22B, 84C STAR1218
29 Jan 74 778p
Rept No: NASA-CR-134346, MDC-E1003-VOL-2
Contract: NAS9-13439
Monitor: 18
Seri-2.

Abstract: Wind tunnel tests were conducted to determine the aerodynamic heating created by gaps in the reusable surface insulation (RSI) thermal protection system (TPS) for the space shuttle. The effects of various parameters of the RSI on convective heating characteristics are described. The winc tunnel tests provided a data base for accurate assessment of gap heating. Analysis and correlation of the data provide methods for predicting heating in the RSI gaps on the space shuttle. (Author)

Descriptors: *Space shuttles, *Thermal control coatings, *Thermal insulation, *Wind tunnel tests, Aerothermodynamics, Heat transfer, Surface properties, Thermodynamic properties

Identifiers: NTISNASA

N74-29289/7 NTIS Prices: PC$42.00/MF$2.25

Data Correlation and Analysis of Arc Tunnel and Wind Tunnel Tests of Rsi Joints and Gaps. Volume 1: Technical Report

McDonnell-Douglas Astronautics Co., St. Louis, Mo.

Final Report, 16 May 1973 - 31 Jan. 1974.
Christensen, H. E., Kipp, H. W.
C3515D2 Fld: 22B, 84C STAR1218
29 Jan 74 230p
Rept No: NASA-CR-134345, MDC-E1003-VOL-1
Contract: NAS9-13439
Monitor: 18
Seri-2.

Abstract: Heat transfer data measured in gaps typical of those under consideration for joints in space shuttle reusable surface insulation protection systems have been assimilated, analyzed and correlated. The data were obtained in four NASA facilities. Several types of gaps were investigated with emphasis on simple butt joints. Gap widths ranged from 0.07 to 0.7 cm and depths ranged from 1 to 6 cm. Laminar, transitional and turbulent boundary layer flows over the gap opening were investigated. Three-dimensional heating variations were observed within gaps in the absence of external flow pressure gradients. Heat transfer correlation equations were obtained for several of the tests. Thermal protection system performance with and without gaps was compared for a representative shuttle entry trajectory. (Author)

Descriptors: *Space shuttles, *Thermal control coatings, *Thermal insulation, *Wind tunnel tests, Aerothermodynamics, Data acquisition, Heat transfer, Surface properties, Thermodynamic properties

Identifiers: NTISNASA

N74-29288/9 NTIS Prices: PC$14.50/MF$2.25

Plasma Tests of Sprayed Coatings for Rocket Thrust Chambers

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Curren, A. N., Love, W. K.
C3514F2 Fld: 21H, 81E, 81K, 71E STAR1218
Jul 74 55p
Rept No: NASA-TM-X-3072, E-7877
Monitor: 18

Abstract: Several plasma-sprayed coating systems were evaluated for structural stability in hydrogen plasma and in oxygen plasma mixed with hydrogen plasma. The principal test heat flux was 15 Btu per inch squared seconds. The system consisted of a number of thin 0.002 to 0.020 in. layers of metal oxides and/or metals. The principal materials included are molybdenum nichrome, alumina, and zirconia. The study identifies important factors in coating system fabrication and describes the durability of the coating systems in the test environments. Values of effective thermal conductivity for some of the systems are indicated. (Author)

Descriptors: *Structural stability, *Thermal control coatings, *Thermal protection, *Thrust chambers, Aluminum oxides, Materials tests, Molybdenum, Temperature effects, Thermodynamic properties, Zirconium oxides

Identifiers: NTISNASA

N74-29216/0 NTIS Prices: PC$3.75/MF$2.25

Structural Evaluation of Candidate Space Shuttle Thermal Protection Systems

Lockheed Missiles and Space Co., Sunnyvale, Calif.

Final Report.
Burns, A. B.
C3162L3 Fld: 22B, 84C, 71D STAR1213
26 Jun 72 66p
Rept No: NASA-CR-132428, LMSC-D157398
Contract: NAS1-11153
Monitor: 18

Abstract: The characteristics and development of a lightweight reusable thermal protection system for the space shuttle are discussed. The test articles consisted of metallic substrates with upper surfaces covered with all-silica, reusable, surface insulation material. The material is processed in the form of tiles. The external surfaces of the tiles are provided with a coating system which consists of a borosilicate coating with a silicon carbide emittance agent and impregnation with a hydrophobic agent. The finished tiles are attached to the metal substrate by adhesive bonding. Charts and graphs of the properties of the material are provided. (Author)

Descriptors: *Composite materials, *Silicon carbides, *Space shuttles, *Thermal control coatings, *Thermal protection, Adhesive bonding, Materials tests, Mechanical properties, Thermodynamic properties

Identifiers: NTISNASA

N74-22502/0 NTIS Prices: PC$6.50/MF$1.45

The Effects of Particle Size on the Optical Properties and Surface Roughness of a Glass-Balloon-Filled Black Paint

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Heslin, T., Heaney, J., Harper, M.
C3155G3 Fld: 11C, 71E STAR1213
May 74 9p
Rept No: NASA-TN-D-7643, G-7432
Monitor: 18

Abstract: The effects of particle size on the optical properties and surface roughness of a glass-balloon-filled, carbon-pigmented paint were studied in order to develop a diffuse-reflecting, low-total-reflectance, low-outgassing black paint. Particle sizes ranged between 20 microns and 74 microns. Surface roughness was found to increase with increasing particle size. Relative total reflectance at near-normal incidence (MgO standard) of the filled paints was less than for the unfilled paint between 230 nm and 1800 nm. Total absolute reflectance at 546 nm decreased with increasing particle size at grazing angles of incidence. Near-normal, total emittance was greater for the filled paints than for the unfilled paint. Specularity decreased with increasing particle size over the range studied. (Author)

Descriptors: *Optical properties, *Paints, *Particle size distribution, *Reflectance, Materials tests, Pigments, Protective coatings, Thermal control coatings

Identifiers: NTISNASA

N74-22227/4 NTIS Prices: PC$3.00/MF$1.45

Spaceflight Performance of Silver Coated Fep Teflon as a Thermal Control Surface on the Imp-1 Spacecraft

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Hoffman, R. H.
C2963I1 Fld: 22B, 84G STAR1211
Apr 73 8p
Rept No: NASA-TM-X-66242, X-762-73-113
Monitor: 18

Abstract: A second surface mirror type coating, vapor deposited silver on FEP Teflon, was used as a thermal control surface for one of the experiments aboard the Imp-I spacecraft. This coating was selected to obtain the low operating temperature required for this experiment. Initial flight temperature of this thermal control surface was -70.5 C, very close to the predicted value of -73 C and at a very satisfactory level. Since temperatures within the spacecraft interior are not at this desired low level, the detectors had to be mounted exterior to the spacecraft with a good view of space, preferably in an area shaded from sunlight. When this latter preference proved unobtainable, the detectors were mounted on an aluminum plate located on the exterior of the spacecraft, parallel to the spin axis but rotating abcut the solar vector. The mounting plate was approximately 6.5 inches by 7.5 inches by 0.125 inches thick. To achieve the cesired temperature level with the mounting plate in such a location, the thermal design had to minimize not only the effects of the relatively warm spacecraft environment but also the effects of the incident solar energy. (Author)

Descriptors: *Explorer 18 satellite, *Spacecraft performance, *Teflon (Trademark), *Thermal control coatings, Low temperature, Metal vapors, Silver, Temperature control

Identifiers: NTISNASA

N74-20539/4 NTIS Prices: PC$4.00/MF$1.45

Selection of Materials and Components for Spacecraft

Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
Wilkens, W.
C2734J4 Fld. 22B, 84G STAR1208
1973 39p
Monitor: 18
Conf-Presented at the Intern. Seminar on Simulation and Space, Toulouse, 10-14 Sep. 1973.

Abstract: Some general aspects are outlined for identifying spacecraft materials and components requirements selection procedures related to functional and environmental capabilities. Problems with the application and extrapolation of existing data are pointed out, emphasizing materials outgassing and contamination. Screening and qualification tests are referreu to and results on tests with a black thermal control paint for Helios satellite are given. These results refer to thermooptical, electrical, outgassing, and contamination properties as well. (Author)

Descriptors: *Helios satellites, *Outgassing, *Spacecraft construction materials, *Thermal control coatings, Space environment simulation, Spacecraft components, Spacecraft contamination

Identifiers: NASA

N74-17579/5 NTIS Prices: PC$5.00/MF$1.45

Methodology Concerning the Simulation of Ionizing Radiations with Special Reference to Coatings when in Geostationary Orbit

Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Automatique.
Bourrieau, J., Paillous, A., Philippon, J., Giacomoni, J., Ziliani, A.
C2732H4 Fld: 11C, 71E STAR1208
1973 32p
Monitor: 18
Conf-Presented at the Intern. Seminar Simulation and Space, Toulouse, 10-14 Sep. 1973.

Abstract: A method for evaluating the behavior of thermal control coatings of satellite in geostationary orbit is described. The mathematical principles of particle computation, and those used for calculation of the doses of energy absorbed by the materials, are discussed. The effects of the different proton and electron energy bands were evaluated. From this, the particle energies and fluxes to be used in environment simulation were deduced. Experimental results concerning aluminized kapton, aluminium paint Pyrolac PSG 108, OSR OCLI, and OSR RTC are presented. The method used can be applied to other types of orbit and to other internal or external components of the satellite.

Descriptors: *Electron irradiation, *Proton irradiation, *Space environment simulation, *Synchronous satellites, *Thermal control coatings, Particle energy, Particle flux density, Radiation damage, Symphonie satellites

Identifiers: NASA

N74-17293/3 NTIS Prices: PC$4.75/MF$1.45

Evaluation of Commercially Supplied Silver Coated Teflon for Spacecraft Temperature Control Usage

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Heaney, J. B.
C2732H2 Fld: 11C, 71E, 84G STAR1208
Jan 74 35p
Rept No: NASA-TM-X-70588, X-765-74-24
Monitor: 18

Abstract: A series of tests are described which were performed to evaluate the acceptability of a commercially supplied silver backed teflon thermal control coating relative to teflon previously coated at GSFC. Optical measurements made on numerous samples indicate that the commercial material possesses an average solar absorptance of 0.085, an emittance of 0.76 and an average alpha/epsilon equal to 0.112, all of which are equivalent to the GSFC coated teflon. The emittance of the protective inconel backing was found to be 0.037. The coating is shown to have good adhesion at the Ag-teflon interface and exposure to UV irradiation uncovered no coating irregularities. Temperature cycling over the range -135 C to +200 C produced crazing in the evaporated Ag layer as expected but no delamination was observed. The suitability of Mystik no. 7366 and 3M no. 467 adhesives as bonding agents for the metallized polymer is demonstrated. Various problems associated with production reproducibility and selection of a proper bonding process are discussed. (Author)

Descriptors: *Spacecraft structures, *Teflon (Trademark), *Thermal control coatings, Bonding, Inconel (Trademark), Irradiation, Performance tests, Silver

Identifiers: NASA

N74-17286/7 NTIS Prices: PC$4.75/MF$1.45

Reliability and Effective Thermal Conductivity of Three Metallic-Ceramic Composite Insulating Coatings on Cooled Hydrogen-Oxygen Rockets

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Price, H. G. Jr, Schacht, R. L., Quentmeyer, R. J.
C2181K3 Fld: 21H, 81G, 71D STAR1201
Nov 73 51p
Rept No: NASA-TN-D-7392, E-7461
Monitor: 18

Abstract: An experimental investigation of the structural integrity and effective thermal conductivity of three metallic-ceramic composite coatings was conducted. These coatings were plasma sprayed onto the combustion side of water-cooled, 12.7-centimeter throat diameter, hydrogen-oxygen rocket thrust chambers operating at 2.07 to 4.14 meganewtons per square meter chamber pressure. The metallic-ceramic composites functioned for six to 17 cycles and for as long as 213 seconds of rocket operations and could have probably provided their insulating properties for many additional cycles. The effective thermal conductivity of all the coatings was in the range of 0.7472 to 4.483 w/(m)(K), which makes the coatings a very effective thermal barrier. Photomicrographic studies of cross-sectioned coolant tubes seem to indicate that the effective thermal conductivity of the 9coatings is controlled by contact resistance between the particles, as a result of the spraying process, and not the thermal conductivity of the bulk materials. (Author)

Descriptors: *Ceramics, *Heat transfer, *Hydrogen oxygen engines, *Metal coatings, *Thermal control coatings, Composite materials, Materials tests, Nuclear rocket engines, Thermodynamic properties

Identifiers: NASA

N74-10723/6 NTIS Prices: PC$3.50/MF$1.45

Design, Develop and Test High Temperature Dynamic Seals for the Space Shuttles Aerodynamic Control Surfaces

Cincinnati Univ., Ohio.

Final Report
C1441H2 Fld: 22B, 84C STAR1116
Jun 73 139p
Rept No: NASA-CR-128951, MCR-73-116
Contract: NAS9-12883
Monitor: 18

Abstract: A description is given of the design, development and testing of high temperature dynamic seals for the gaps between the structure and aerodynamic control surfaces on the space shuttle. These aerodynamic seals are required to prevent high temperature airflow from damaging thermally unprotected structures and components during entry. Two seal concepts evolved a curtain seal for the spanwise elevon cove gap, and a labyrinth seal for the area above the elevon, at the gap between the end of the elevon and the fuselage. On the basis of development testing, both seal concepts were shown to be feasible for controlling internal temperatures to 350 F or less when exposed to a typical space shuttle entry environment. The curtain seal concept demonstrated excellent test results and merits strong consideration for application on the space shuttle orbiter. The labyrinth seal concept, although demonstrating significant temperature reduction characteristics, may or may not be required on the Orbiter, depending on the actual design configuration and flight environment. (Author)

Descriptors: *Aerodynamic configurations, *Control surfaces, *High temperature environments, *Seals (stoppers), *Space shuttle orbiters, Feasibility analysis, Gaps, High temperature air, Spacecraft structures

Identifiers: NASA

N73-25891 NTIS Prices: PC$9.00/MF$1.45

Thermal-Vacuum Test Report for the Ultraviolet Spectrometer Thermal Model

Cincinnati Univ., Ohio.
Wingate, C. A. Jr
C1433L2 Fld: 22B, 84C STAR1116
25 Jul 72 48p
Rept No: NASA-CR-128562, APL-S4S-72-094
Contract: NAS9-11528
Monitor: 18

Abstract: Early design studies showed that the UV spectrometer thermal design margins were very small so that an experimental confirmation of the analytical model would be desirable. At that time the prototype unit was scheduled too far downstream to be of value, so a separate thermal model was built for use in verifying the analytical model. (Author)

Descriptors: *Thermal control coatings, *Ultraviolet spectrometers, *Vacuum tests, Apollo 17 flight, Dynamic models, Production planning, Reliability engineering, Thermal resistance

Identifiers: NASA

N73-25509 NTIS Prices: PC$4.50/MF$1.45

Effect of Contamination on the Optical Properties of Transmitting and Reflecting Materials Exposed to a Mmh/N2O4 Rocket Exhaust

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Bowman, R. L., Spisz, E. W., Jack, J. R.
C1051A1 Fld: 21B, 81A, 80H STAR1111
Apr 73 12p
Rept No: NASA-TM-X-68204, E-7373
Monitor: 18
Conf- Presented At the 7th Jannaf Plume Technol. Conf., Restone Arsenal, Ala., 3-5 Apr. 1973

Abstract: The changes are presented in spectral transmittance, and reflectance due to exposure of various optical materials e of a 5-pound thrust bipropellant rocket. The engine was fired in a pulsed mode for a total exposure of 223.7 second. Spectral optical properties were measured in air before and after exposure to the exhaust plume in vacuum. The contaminating layer resulted in both absorption and scattering effects which caused changes as large as 30-50% for transmitting elements and 15% for mirrors in the near ultraviolet wavelengths. The changes in spectral properties of materials exposed to the exhaust plume for 44 and 223.7 seconds are compared and found to be similar. (Author)

Descriptors: *Optical equipment, *Optical properties, *Rocket exhaust, Reflectance, Thermal control coatings, Transmittance, Ultraviolet radiation

Identifiers: NASA

N73-20942 NTIS Prices: PC$3.00/MF$0.95

Effect of Thruster Pulse Length on Thruster-Exhaust Damage of S13G White Thermal Control Coatings

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Sommers, R. D., Raquet, C. A.
C1045L3 Fld: 21B, 81A STAR1111
1973 14p
Rept No: NASA-TM-X-68213, E-7361
Monitor: 18
Conf- Presented At the 7th Jannaf Plume Technol. Conf., Redstone Arsenal, Ala., 3-5 Apr. 1973

Abstract: Rocket exhaust products which strike thermal control surfaces cause changes in solar absorptance (Alpha Sub s) and thermal emittance (Epsilon) of these surfaces. A study was made of the effect of rocket pulse duration on exhaust damage to S13G white coatings. Two pulse lengths were used - 14 msec and 50 msec. An MMH/N2O4 bipropellant 5-lb thrust rocket was fired into a simulated space environment with a vacuum of 0.00001en1 torr, a liquid helium temperature enclosure, and solar radiation. The changes in solar absorptance and thermal emittance of S13G white coatings due to rocket exhaust were made in-situ for total firing times of 58 seconds with 14 msec pulses and 223.7en1 sec with 50 msec pulses. The solar absorptance of S13G increased 25 percent due to 223.7 sec of exposure to 50 msec pulses and the thermal emittance was unaffected. The ratio of Alpha Sub s/Epsilon therefore increased by 25 percent. The short 14en1 msec pulse exhaust exposure caused between 40 and 70 percent increase in solar absorptance and a decrease of between 13 and 18 percent in thermal emittance. The corresponding increase in Alpha Sub s/Epsilon ratio was between 80 and 100 percent. Ultraviolet radiation was present in the short pulse test and may have contributed to the large damage of that test. (Author)

Descriptors: *Pulse duration, *Rocket exhaust, *Thermal absorption, *Thermal control coatings, Solar radiation, Thermal emission, Ultraviolet radiation

Identifiers: NASA

N73-20940 NTIS Prices: PC$3.00/MF$0.95

Testing to Determine the Vacuum-Ultraviolet Degradation Rate of Thermal Control Coatings

IIT Research Inst., Chicago, Ill. Technology Center.

Final Report, 5 May - 25 Nov. 1972
Gilligan, J. E.
C1043G4 Fld: 11C, 71E STAR1111
27 Nov 72 20p
Rept No: NASA-CR-124149, IITRI-C6258-5
Contract: NAS8-28765, IITRI PROJ. C6258
Monitor: 18

Abstract: Samples of S-13G that had been exposed to the salt air environment of Cape Kennedy, Florida were irradiated with simulated solar ultraviolet radiation after various cleaning treatments. In both of the the tests conducted two of the salt air exposed samples were not cleaned, two were lightly cleaned with water and detergent (i.e. rinsed), and two were vigorously scrubbed. Several other white thermal control coatings were also irradiated. The solar absorptance values of these coatings before and as a result of the ultraviolet irradiation are reported for exposure levels up to approximately 2000 ESH. (Author)

Descriptors: *Irradiation, *Thermal control coatings, *Ultraviolet radiation, Cleaning, Environmental tests, Salt spray tests, Spectral reflectance

Identifiers: NASA

N73-20608 NTIS Prices: PC$3.00/MF$0.95

Development of Flight Units for Thermal Control Coatings Experiment

TRW Systems Group Redondo Beach Calif (354595)

Final rept. May 71-Sep 72
Luedke, E. E., Kelley, L. R.
C0804L1 Fld: 11C, 22B, 71E, 84G GRAI7312
Oct 72 145p
Rept No: TRW-18595
Contract: F33615-71-C-1448
Project: AF-7340
Task: 734007
Monitor: AFML-TR-72-233

Abstract: The objective of the program is to design, fabricate, and test experimental flight packages capable of measuring the long term degradation of solar absorptance of thermal control coatings (TCC) in the space environment. Use of these highly accurate flight units will allow correlation of the performance of experimental TCC in the actual space environment with that exhibited in laboratory in situ simulated space environments. Six experiment packages capable of testing eight TCC surfaces each on an orbiting spacecraft have been developed. Each package weighs 430 grams, consumes 350 mw of power, operates from 28 plus or minus 5V, and provides a 0-5 V telemetry output with an overall accuracy of plus or minus 1F. A prototype flight unit successfully passed thermal cycling, shock, vibration and humidity test qualifications. (Author)

Descriptors: (*Satellites(Artificial), Temperature control), (*Temperature control, *Coatings), Space environmental conditions, Environmental tests, Solar radiation, Radiation damage, Heat-resistant materials, Computer programs, Flight testing

Identifiers: *Thermal control coatings, AF

AD-759 083 NTIS Prices: PC$3.00/MF$0.95

Preparation of Pigments for Space-Stable Thermal Control Coatings

Ohio State Univ. Research Foundation, Columbus.

Final Report, 1 Jun. 1968 - 31 Mar. 1972
Campbell, W. B., Smith, R. G.
C0791C2 Fld: 11C, 71E STAR1109
May 72 188p
Rept No: NASA-CR-124067
Contract: NAS8-21317
Monitor: 18

Abstract: The identification and control of vapor phase reaction kinetics to produce pigments by homogeneous nucleation were achieved. A vapor phase apparatus was designed, fabricated, and calibrated through 1800 C. Vapor phase reactions were analyzed, calculations made, and powders of alumina, rutile, zinc orthotitanate (in a mixed phase), calcium tungstate, and lanthana were produced by homogeneous nucleation. Electron microscopy shows uniform particle morphology and size, and supports anticipated advantages of vapor-phase homogeneous nucleation; namely, purity, freedom from defects, and uniform particle sizing without grinding. (Author)

Descriptors: *Pigments, *Solar radiation shielding, *Spacecraft shielding, *Stability, *Thermal control coatings, *Vapor phases, Aluminum oxides, Calcium tungstates, Nucleation, Reaction kinetics, Zinc compounds

Identifiers: NASA

N73-18144 NTIS Prices: PC$11.50/MF$0.95

Analysis of Shape of Porous Cooled Medium for an Imposed Surface Heat Flux and Temperature

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Siegel, R.
C0741K1 Fld: 20M, 80P STAR1108
Mar 73 36p
Rept No: NASA-TN-D-7176, E-7104
Monitor: 18

Abstract: The surface of a porous cooled medium is to be maintained at a specified design temperature while being subjected to uniform heating by an external source. An analytical method is given for determining the shape of the medium surface that will satisfy these boundary conditions. The analysis accounts for temperature dependent variations of fluid density and viscosity and for temperature dependent matrix thermal conductivity. The energy equation is combined with Darcy's law in such a way that a potential can be defined that satisfies Laplace's equation. All of the heat-transfer and flow quantities are expressed in terms of this potential. The determination of the shape of the porous cooled region is thereby reduced to a free-boundary problem such as in inviscid free jet theory. Two illustrative examples are carried out: a porous leading edge with coolant supplied through a slot and a porous cooled duct with a rectangular outer boundary. (Author)

Descriptors: *Cooling systems, *Heat transfer, *Porous materials, *Temperature control, Boundary layer flow, Thermal conductivity, Thermodynamic properties

Identifiers: NASA

N73-17919 NTIS Prices: PC$3.00/MF$0.95

Studies Relating to Temperature Control of a Large Scale Telescope

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Katzoff, S.
C0663D2 Fld: 17H, 63F STAR1107
Feb 73 63p
Rept No: NASA-TN-D-7174, L-8741
Monitor: 18

Abstract: Analytical methods are developed for estimating the circumferential and longitudinal temperature distributions in a large space telescope, idealized as a simple insulated tube with a flat mirror across one end. The effects of wall conduction, multilayer insulation, thermal coatings, heat pipes, and heated collars are analyzed, with numerical examples. For most of the study, the only thermal input to the tube was assumed to be from steady solar irradiation from one side, as in a geosynchronous orbit. Unsteady heat flow through the insulation, as in alternating sunlight and shadow of a low orbit, is briefly discussed. (Author)

Descriptors: *Astronomical telescopes, *Mathematical models, *Temperature control, Heat pipes, Integral equations, Multilayer insulation, Radiative heat transfer, Temperature distribution, Thermal control coatings

Identifiers: NASA

N73-16931 NTIS Prices: PC$3.00/MF$0.95

Study on Lead Monoxide as a Solid Lubricant for High Temperatures

National Aerospace Lab., Tokyo (Japan).
Miyakawa, Y., Nishimura, M., Abe, W.
C0501G3 Fld: 11H, 71K STAR1104
May 72 58p
Rept No: NAL-TR-285
Monitor: 18
LANG- IN JAPANESE ENGLISH SUMMARY

Abstract: A study of the friction, wear and endurance life of lead monoxide (PbO) was made in room air, in controlled atmospheres and in vacuum at high temperatures up to 800 C. Also, studies were made to determine the lead monoxide coating procedure on stainless steel. A cylindrical rider was rubbed with a rotating disk, at sliding velocities from 0.01 m/s to 3 m/s. The rider specimen was tool steel and the disks were austenic stainless steel and pure metals of Fe, Ni, Cu, and Al. The lubricating properties of PbO of the layer made on the surface of a rotating disk and the PbO pellet were examined. An analysis of the results obtained is presented. (Author)

Descriptors: *Friction measurement, *High temperature tests, *Lead oxides, *Solid lubricants, *Wear tests, Ceramic coatings , Controlled atmospheres, Life (durability), Stainless steels, Thin films, Vacuum effects

N73-13470 NTIS Prices: PC$5.00/MF$0.95

Orbital Operations and Preliminary Results for the Satellite Prospero

Royal Aircraft Establishment, Farnborough (England).
Adams, V. W.
C0363D1 Fld: 17G, 76A, 84G STAR1103
Jun 72 75p
Rept No: RAE-TR-72088, BR-29634
Monitor: 18

Abstract: The satellite Prospero (1971-93A) was launched from Woomera by the British Black Arrow launcher on 28 October 1971. Operations for the recovery of data from Prospero in orbit are described, based largely on the orbital operations plan produced prior to launch. Results from operational control reports are also given. A brief description of the satellite and its telemetry are given in appendices. (Author)

Descriptors: *Experimental design, *Onboard equipment, *Performance tests, *Satellite control, *Satellite instruments , Data processing, European space programs, Great britain, Micrometeoroids, Satellite tracking, Solar cells, Thermal control coatings

N73-12928 NTIS Prices: PC$5.75/MF$0.95

Degradation Mechanisms of Pigmented Coatings

Ohio State Univ Research Foundation Columbus (267360)

Final rept. 1 Jan 71-30 Aug 72
Campbell, William B., Cochran, Joe K. Jr
C0242J3 Fld: 11C, 22B, 71E GRAI7304
Oct 72 87p*
Contract: F33615-71-C-1257
Project: AF-7342
Task: 734202
Monitor: AFML-TR-71-42-Pt-2
See also AD-725 754.

Abstract: Oxygen transport in polymonomethylsiloxane was investigated and compared to polydimethylsiloxane properties. The effects of rutile pigmentation on the permeability, diffusion, and solubility of oxygen through polymonomethylsiloxane were investigated. Permeability and diffusion constants decreased with increasing pigment concentration and there was no evidence of oxygen sorption on the pigment. Relative adhesion of polydimethylsiloxane and polymonomethylsiloxane on rutile was predicted from water contact angles Polymonomethylsiloxane was proposed to have the greater adhesion but was small in either case. The stability of dimethyl and monomethyl polysiloxanes pigmented with rutile and zinc oxide was evaluated in a simulated solar ultraviolet environment. (Author)

Descriptors: (*Paints, Degradation), (*Plastic coatings, Permeability), (*Silicone plastics, *Plastic paints), Diffusion, Oxygen, Rutile, Pigments, Zinc compounds, Ultraviolet radiation, Space environmental conditions, Absorption, Solubility, Surfaces

Identifiers: *Thermal control coatings, Polymer gas permeability, Poly(siloxane/dimethyl), Poly(siloxane/methyl), Zinc titanate

AD-753 410 NTIS Prices: PC$4.85/MF$0.95

Effective Thermal Conductivities of Four Metal Ceramic Composite Coatings in Hydrogen-Oxygen Rocket Firings

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Schacht, R. L., Price, H. G. Jr, Quentmeyer, R. J.
C0235C1 Fld: 21H, 81F, 71E STAR1101
Nov 72 43p
Rept No: NASA-TN-D-7055, E-7035
Monitor: 18

Abstract: An experimental investigation was conducted to determine the effective conductivities of four plasma-arc-sprayed, metal-ceramic gradated coatings on hydrogen-oxygen thrust chambers. The effective thermal conductivities were not a function of pressure or oxidant-to-fuel ratio. The various materials that made up these composites do not seem to affect the thermal conductivity values as much as the differences in the thermal conductivities of the parent materials would lead one to expect. Contact resistance evolving from the spraying process seems to be the controlling factor. The thermal conductivities of all the composites tested fell in the range of 0.75 to 7.5 watts per meter kelvin. (Author)

Descriptors: *Ceramic coatings, *Metal coatings, *Rocket nozzles, *Thermal conductivity, Contact resistance, Heat transfer, Hydrogen oxygen engines, Plasma spraying, Rocket firing, Thermal control coatings

N73-10961 NTIS Prices: PC$3.00/MF$0.95

Evaluation of Nondestructive Testing Techniques for the Space Shuttle Nonmetallic Thermal Protection System

Mcdonnell-douglas Astronautics Co., Huntington Beach, Calif.
Tiede, D. A.
C0234L2 Fld: 22B, 84C, 71M, 73 STAR1101
Jul 72 136p
Rept No: NASA-CR-128607, MDC-G3678
Contract: NAS9-12180
Monitor: 18

Abstract: A program was conducted to evaluate nondestructive analysis techniques for the detection of defects in rigidized surface insulation (a candidate material for the Space Shuttle thermal protection system). Uncoated, coated, and coated and bonded samples with internal defects (voids, cracks, delaminations, density variations, and moisture content), coating defects (holes, cracks, thickness variations, and loss of adhesion), and bondline defects (voids and unbonds) were inspected by X-ray radiography, acoustic, microwave, high-frequency ultrasonic, beta backscatter, thermal, holographic, and visual techniques. The detectability of each type of defect was determined for each technique (when applicable). A possible relationship between microwave reflection measurements (or X-ray-radiography censity measurements) and the tensile strength was established. A possible approach for in-process inspection using a combination of X-ray radiography, acoustic, microwave, and holographic techniques was recommended. (Author)

Descriptors: *Nondestructive tests, *Space shuttles, *Thermal protection, Tensile strength, Thermal control coatings, Ultrasonic tests, X ray analysis

N73-10893 NTIS Prices: PC$9.00/MF$0.95

Apparatus for Controlling the Temperature of Balloon Borne Equipment

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

Patent Application
Schach, M. , Triolo, J. J.
C0215K4 Fld: 4A, 55A STAR1024
14 Aug 72 18p
Rept No: NASA-CASE-GSC-11620-1, US-PATENT-APPL-SN-280305
Monitor: 18
Government-owned invention available for licensing. Copy of application available NTIS.

Abstract: The development of a temperature control device for use with balloon-borne equipment is discussed. The device will control the temperature of batteries and electronic instrumentation packages carried by balloons to high altitudes. The configuration of the Mylar enclosure contains the radiant energy emitted by the earth and its atmosphere and reflects the radiation emitted by the instrumentation package, thus reducing the heat loss.

Descriptors: *Balloons, *Electric batteries, *Electronic modules, *Temperature control, Mylar (trademark), Patent applications, Product development, Protective coatings

N72-33379 NTIS Prices: PC$3.00/MF$0.95

Mechanical Behavior of Oxide Free Stainless Steel Surfaces in a Low Pressure Hydrogen Environment

Sandia Labs., Albuquerque, N.Mex. (5659000)
Cuthrell, R. E.
A6933E3 Fld: 11F, 71J NSA3108
Jan 75 41p
Contract: AT(29-1)-789
Monitor: 18

Abstract: For abstract, see NSA 31 08, number 20273.

Descriptors: (*Stainless steel-440, *Mechanical properties), (*Hydrogen, *Corrosive effects), Adsorption, Controlled atmospheres, Desorption, Medium temperature, Oxides, Surface cleaning, Ultrahigh vacuum

Identifiers: NTISAEC

SAND-74-0376 NTIS Prices: PC$5.25/MF$2.25

Evaluation of Coated Columbian Alloy Heat Shields for Space Shuttle Thermal Protection System Application. Volume 1 Phase 1 - Environmental Criteria and Material Characterization, October 1970 - March 1972

General Dynamics/Convair, San Diego, Calif. Aerospace Div.
Black, W. E.
A5551A2 Fld: 22B, 84C STAR1021
Jun 72 325p
Rept No: NASA-CR-112119
Contract: NAS1-9793
Monitor: 18

Abstract: The studies presented are directed toward establishing criteria for a niobium alloy thermal protection system for the space shuttle. Evaluation of three niobium alloys and two silicon coatings for heat shield configurations culminated in the selection of two coating/substrate combinations for environmental criteria and material characterization tests. Specimens were exposed to boost and reentry temperatures, pressure, and loads simulating a space shuttle orbiter flight profile.

Descriptors: *Heat shielding, *Niobium alloys, *Silicon, *Space shuttles, *Thermal control coatings, Space environment simulation, Spacecraft shielding, Thermal insulation

N72-30948 NTIS Prices: PC$18.25/MF$0.95

Achievement of a Low-Outgassing White Paint System for Spacecraft Thermal Control

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Seidenberg, B. , Park, J. J., Clatterbuck, C.
A5513L2 Fld: 11C, 71E STAR1019
Aug 72 18p
Rept No: NASA-TN-D-6892, G-1067
Monitor: 18

Abstract: Test results and data for achieving a low-outgassing polymer resin suitable for potting or a paint pigment are presented. The resin, prepared in 0.5-kg (1-lb) batches, is acceptable for spacecraft use; its weight loss is less than 0.5 percent, and the volatile condensable materials are less than 0.05 percent. The paint adheres to a primed fiber glass or aluminum substrate. Results of UV irradiation, electron and proton radiation, and thermal cycling are presented. (Author)

Descriptors: *Outgassing, *Paints, *Potting compounds, *Temperature control, Polymerization, Thermal cycling tests

N72-28572 NTIS Prices: PC$3.00/MF$0.95

Investigation of Phase-Change Coatings for Variable Thermal Control of Spacecraft

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Kelliher, W. C., Young, P. R.
A5001D4 Fld: 11C, 71E, 84C STAR1016
Jun 72 20p
Rept No: NASA-TN-D-6756, L-6283

Abstract: An investigation was conducted to determine the feasibility of producing a spacecraft coating system that could vary the ratio of its solar absorptance to thermal emittance to adjust automatically for changes in the thermal balance of a spacecraft. This study resulted in a new concept called the phase-change effect which uses the change that occurs in the optical properties of many materials during the phase transition from a crystalline solid to an amorphous material. A series of two-component model coatings was developed which, when placed on a highly reflecting substrate, exhibited a sharp decrease in solar absorptance within a narrow temperature range. A variable thermal control coating can have a significant amount of temperature regulation with the phase-change effect. Data are presented on several crystallite-polymer formulations, their physical and optical properties, and associated phase-change temperatures. Aspects pertaining to their use in a space environment and an example of the degree of thermal regulation attainable with these coatings is also given. (Author)

Descriptors: *Spacecraft structures, *Temperature effects, *Thermal control coatings, Phototropism, Product development, Spacecraft environments, Thermodynamic properties

N72-25924 NTIS Prices: PC$3.00/MF$0.95

APOLLO 9 Thermal-Control-Coating Degradation

National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
Smith, J. A.
A4995J2 Fld: 11C, 71E, 84C STAR1016
Jun 72 18p
Rept No: NASA-TN-D-6863, MSC-S-314

Abstract: Analytical studies, ground-test data, and flight data before 1967 indicated that degradation of Apollo thermal-control coatings could be expected, possibly to an extent requiring spacecraft design changes to accomplish the worst-case lunar-landing mission. On the Apollo 9 mission, specimens of Apollo thermal-control coatings were retrieved by the astronauts during the extravehicular activity. These specimens were the first to be returned to earth from space unaffected by entry conditions. Subsequent measurements of the thermophysical properties (solar absorptance and hemispherical emittance) of the thermal-control-sample coatings revealed degradation levels well within the design capability of the Apollo spacecraft. (Author)

Descriptors: *Apollo 9 flight, *Physical properties, *Thermal control coatings, *Thermodynamic properties. Degradation, Materials tests, Spacecraft construction materials

N72-25864 NTIS Prices: PC$3.00/MF$0.95

Ultraviolet Radiation Effects on the Infrared Damage Rate of a Thermal Control Coating

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Bass, J. A.
A4802K4 Fld. 11C, 71E STAR1014
May 72 11p
Rept No: NASA-TN-D-6686, G-1055

Abstract: The effects of ultraviolet radiation on the infrared reflectance of ZnO silicone white thermal coatings were investigated. Narrow band ultraviolet radiation for wavelengths in the 2200A to 3500A range by a monochromator and a high pressure, 150-W Eimac xenon lamp. The sample was irradiated while in a vacuum of at least 0.000001 torr, and infrared reflectance was measured in situ with a spectroreflectometer at 19,500A. Reflectance degradation was studied as a function of wavelength, time, intensity, and dose. Damage was wavelength dependent at constant exposure, but no maximum was evident above the shortest wavelength investigated here. The degradation rate at constant intensity was an exponential function of time and varies with intensity. (Author)

Descriptors: *Infrared reflection, *Thermal control coatings, *Thermal degradation, *Ultraviolet radiation, Silicones, Spectral reflectance, Zinc oxides

N72-23585 NTIS Prices: PC$3.00/MF$0.95

Optical Properties of Thermal Control Coating Contaminated by Mmh/N2O4 5-Pound Thruster in a Vacuum Environment with Solar Simulation

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Sommers, R. D., Raquet, C. A., Cassidy, J. F.
A4582A3 Fld: 11C, 71E STAR1012
1972 16p
Rept No: NASA-TM-X-68044, E-6881
Conf- Presented At 7th Thermophys. Conf., San Antonio, 10-12 Apr. 1972 Sponsored By Aiaa

Abstract: Cat-a-lac Black, and S13G thermal control coatings were exposed to the exhaust of a thruster in a simulated space environment. Vacuum was maintained emission mns thermodynamic propertiesenvironmental teststemperature measurement abs Cat-a-lac Black, and S13G thermal control coatings were exposed to the exhaust of a thruster in a simulated space environment. Vacuum was maintained at less than 10 to the minus 5th power torr during thruster firing in the liquid helium cooled facility. The thruster was fired in a 50-millisecond pulse mode and the accumulated firing time was 224 seconds. Solar absorptance (alpha sub s) and thermal emittance (sigma) of the coatings were measured in-situ at intervals of 300 pulses. A calorimetric technique was used to measure alpha sub s and sigma. The tests, technique, and test results are presented. The Cat-a-lac Black coatings showed no change in alpha sub s or sigma. The S13G showed up to 25 percent increase in alpha sub s but no change in sigma. (Author)

Descriptors: *Aerospace environments, *Protective coatings, *Thermal control coatings, *Thermal emission, Environmental tests, Temperature measurement, Thermodynamic properties

N72-21952 NTIS Prices: PC$3.00/MF$0.95

APOLLO Experience Report Thermal Design of APOLLO Lunar Surface Experiments Package

National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
Harris, R. S. Jr
A4565L2 Fld: 22A, 84B STAR1011
Mar 72 26p
Rept No: NASA-TN-D-6738, MSC-S-310

Abstract: The evolution of the thermal design of the Apollo lunar surface experiments package central station from the basic concept to the final flight hardware is discussed, including results of development, prototype, and qualification tests that were used to verify that the flight hardware would operate adequately on the lunar surface. In addition, brief discussions of the thermal design of tests that were used to verify that the flight hardware would operate adequately on the lunar surface. In addition, brief discussions of the thermal design of experiments included in the experiments package are presented. The flight thermal performance is compared with analytical results and thermal-vacuum test results, and design modifications for future lunar surface experiment packages are presented. (Author)

Descriptors: *Apollo lunar surface experiments package. *Temperature control, *Thermal protection, Environmental tests , Mathematical models, Systems engineering

N72-20842 NTIS Prices: PC$3.00/MF$0.95

In-Space Fabrication of Thin-Film Structures

Astro Research Corp., Santa Barbara, Calif.

Final Report
Lippman, M. E.
A435582 Fld: 11C, 71E STAR1008
Feb 72 18p
Rept No: NASA-CR-1969, ARC-R-410
Contract: NAS7-728

Abstract: A conceptual study of physical vapor-depcsition processes for in-space fabrication of thin-film structures is presented. Potential advantages of in-space fabrication are improved structural integrity and surface, reflectivity of free-standing ultra-thin films and coatings. Free- standing thin-film structures can find use as photon propulsion cevices (solar sails). Other applications of the concept involve free-standing shadow shields, or thermal control coatings of spacecraft surfaces. Use of expendables (such as booster and interstage structures) as source material for the physical vapor deposition process is considered. The practicability of producing thin, textured, aluminum films by physical vapor deposition and subsequent separation from a revolving substrate is demonstrated by laboratory experiments. Heating power requirement for the evaporation process is estimated for a specific mission. (Author)

Descriptors: *Low gravity manufacturing, *Thin films, *Vapor deposition, Metal films, Payloads, Solar sails, Systems engineering, Thermal control coatings

N72-17538 NTIS Prices: PC$3.00/MF$0.95

Performance of High Speed Ball Bearings with Lead Plated Retainers in Liquid Hydrogen for Potential Use in a Radiation Environment

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Wisander, D. W., Brewe, D. E., Scibbe, H. W.
A4161B4 Fld: 13I, 69H STAR1007
Feb 72 13p
Rept No: NASA-TN-D-6653, E-6642

Descriptors: *Ball bearings, *Controlled atmospheres, *Liquid hydrogen, *Performance tests, *Service life, Lubrication, Metal coatings, Retaining

N72-16335 NTIS Prices: PC$3.00/MF$0.95

Investigation of Space Stable Thermal Control Coating Properties

Teledyne Brown Engineering, Huntsville, Ala.

Final Report
Mookherji, T.
A4065I1 Fld: 11C, 71E STAR1006
Oct 71 32p
Rept No: NASA-CR-123491, SE-SSL-1410
Contract: NAS8-25900

Descriptors: *Nuclear magnetic resonance, *Spacecraft structures, *Thermal control coatings, Teflon (trademark), Ultraviolet radiation, Zinc oxides

N72-15911 NTIS Prices: PC$3.00/MF$0.95

Space Thermal Control Development

Lockheed Missiles and Space Co., Huntsville, Ala.

Final Report
Hoover, M. J., Grodzka, P. G., Oneill, M. J.
A4053E1 Fld: 20M, 80P STAR1005
Dec 71 80p
Rept No: NASA-CR-124910, HREC-5183-3
Contract: NAS8-25183

Descriptors: *Composite materials, *Fusibility, *Thermal control coatings, *Thermal resistance, Aluminum, Lithium compounds, Metals, Nitrogen compounds, Phase transformations, Thermal diffusion, Thermodynamic properties, Zinc compounds

N72-14947 NTIS Prices: PC$3.00/MF$0.95

Preparation of Pigments for Space-Stable Thermal Control Coatings

Ohio State Univ. Research Foundation, Columbus.

Interim Report, Sep. 1970 - Jan. 1971
Campbell, W. B., Nychas, S. G., Smith, R. G.
A4045F3 Fld: 7A, 71E, 59B STAR1005
Feb 71 42p
Rept No: NASA-CR-121061
Contract: NAS8-21317

Descriptors: *Pigments, *Thermal control coatings, *Vapor deposition, *Zinc compounds, Production engineering, Titanates, , Vapor phases

N72-14593 NTIS Prices: PC$3.00/MF$0.95

Exploratory Screening Tests of Several Alloys and Coatings for Automobile Thermal Reactors

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Oldrieve, R. E.
A4045C3 Fld: 13F, 85D STAR1005
Dec 71 30p
Rept No: NASA-TM-X-67984, E-6717

Descriptors: *Automobiles, *Cobalt alloys, *Iron alloys, *Nickel alloys, *Thermal reactors, Environmental control, Pollution, Protective coatings, Stainless steels

N72-14549 NTIS Prices: PC$3.00/MF$0.95

Evaluation of Some Candidate Materials for Automobile Thermal Reactors in Engine-Dynamometer Screening Tests

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

Interim Report
Oldrieve, R. E.
A4045C1 Fld: 13F, 85D STAR1005
Dec 71 29p
Rept No: NASA-TM-X-67970, E-6684

Descriptors: *Automobiles, *Dynamometers, *Iron alloys, *Nickel alloys, *Thermal reactors, Environmental control, Pollution, Protective coatings

N72-14547 NTIS Prices: PC$3.00/MF$0.95

Vacuum and Ultraviolet Radiation Effects on Binders and Pigments for Spacecraft Thermal Control Coatings

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Progar, D. J., Wade, W. R.
A393484 Fld: 11C, 71E STAR1003
Nov 71 42p
Rept No: NASA-TN-D-6546, L-7722

Descriptors: *Protective coatings, *Thermal control coatings, *Ultraviolet radiation, *Vacuum effects, Pigments, Radiation effects, Silicone resins

N72-12941 NTIS Prices: PC$3.00/MF$0.95

A Method of Treating the Non-Grey Error in Total Emittance Measurements

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Heaney, J. B., Henninger, J. H.
A3931D3 Fld: 20F, 80H STAR1003
Dec 71 13p
Rept No: NASA-TN-D-6501, G-1026

Descriptors: *Emittance, *Protective coatings, *Thickness, Surface properties, Temperature control, Thermal insulation

N72-12631 NTIS Prices: PC$3.00/MF$0.95

Intumescent Paint Containing Nitrile Rubber

National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

Patent Application
Sawko, P. M.
A3821L2 Fld: 11C, 71E, 83A STAR1002
12 Feb 71 10p
Rept No: NASA-CASE-ARC-10196-1, US-PATENT-APPL-SN-115082

Descriptors: *Fire control, *Nonflammable materials, *Rubber coatings, *Thermal control coatings, Ablative materials, Charring, Fire prevention, Patent applications, Phenolic resins, Protective coatings

N72-11456 NTIS Prices: PC$3.00/MF$0.95

Arc Jet Tests of Metallic Tps Materials

National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
Centolanzi, F. J., Probst, H. B., Lowell, C. E., Zimmerman, N. B.
A3644K3 Fld: 11F, 71E STAR0924
15 Oct 71 32p
Rept No: NASA-TM-X-62092
Subm- Prepared Jointly With Nasa. Lewis Res. Center, Cleveland

Descriptors: *Arc heating, *Cobalt alloys, *High temperature tests, *Metal coatings, *Nickel alloys, *Space shuttles, *Thermal control coatings, Electron microscopes, Metallography, X ray diffraction

N71-38068 NTIS Prices: PC$3.00/MF$0.95

Ultraviolet Radiation Effects on the Infrared Damage Rate of a Thermal Control Coating

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Bass, J. A.
A3561I2 Fld: 10C, 71E, 71L STAR0923
Sep 71 12p
Rept No: NASA-TM-X-65704, X-762-71-391

Descriptors: *Radiation damage, *Thermal control coatings, *Ultraviolet radiation, Numerical analysis, Radiation effects, Thermodynamic properties

N71-37556 NTIS Prices: PC$3.00/MF$0.95

Investigation of Fep Teflon as a Cover for Silicon Solar Cells

Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.

Final Report, Jul. 1970 - May 1971
Greenberg, S. A., Mccargo, M. , Palmer, W. L.
A3531B2 Fld: 10A, 67G STAR0922
Aug 71 69p
Rept No: NASA-CR-72970, LMSC-D243070
Contract: NAS3-14398

Descriptors: *Accelerated life tests, *Humidity, *Sealing, *Solar cells, *Teflon (trademark), *Thermal control coatings, Environmental tests, Thermal shock, Thermal stability

N71-35231 NTIS Prices: PC$3.00/MF$0.95

THE EFFECTS OF WATER IMPINGING ON THERMALLY CONTROLLED SURFACES UNDER SPACE CONDITIONS

Louisiana State Univ., Baton Rouge. Dept. of Mechanical and Aerospace Engineering.
Maples, D. , Spiller, M. H.
A3445L1 Fld: 11C, 71L, 71E STAR0921
1971 71p
Rept No: NASA-CR-121870
Contract: NGR-19-001-068

Descriptors: *Monochromatic radiation, *Optical reflection, *Paints, *Spraying, *Water, Aerospace environments, Ice, Rain impact damage, Spray nozzles

N71-35151 NTIS Prices: PC$3.00/MF$0.95

THERMAL CONTROL FOR MOBLE PACKAGES IN THE DUSTY LUNAR ENVIRONMENT

Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
Baker, R. H., Langley, R. J.
A3445K4 Fld: 13A, 69A STAR0921
Jun 71 83p
Rept No: NASA-CR-121874, TR-7L-2
Contract: NAS9-11540

Descriptors: *Lunar dust, *Lunar environment, *Lunar mobile laboratories, *Surface properties, *Thermal protection, *Thermal radiation, Infrared radiation, Radiation shielding, Radiative heat transfer

N71-35150 NTIS Prices: PC$3.00/MF$0.95

SPACE SHUTTLE INVESTIGATION OF STATIC AERODYNAMIC CHARACTERISTICS OF THE MSC 251 BOOSTER

Chrysler Corp., New Orleans, La. Space Div.
Moore, R. H.
A3445C1 Fld: 22B, 84C STAR0921
Nov 70 403p
Rept No: NASA-CR-103164, DMS-DR-1033
Contract: NAS8-4016

Descriptors: *Low speed wind tunnels, *Space shuttles, *Static aerodynamic characteristics, *Wind tunnel models, Elevators (control surfaces), Pressure, Reynolds number, Scale models, Stagnation temperature, Tail assemblies, Wings

N71-35106 NTIS Prices: PC$6.00/MF$0.95

Oxidation Screening at 1204 C (2200 F) Of Candidate Alloys for the Space Shuttle Thermal Protection System

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Barrett, C. A., Sanders, W. A.
A2804D1 Fld: 11F, 22B, 71G, 84C STAR0916
1971 30p
Rept No: NASA-TM-X-67864, E-6404
Conf- Proposed for Presentation At Space Shuttle Mater. Conf., Madison, Ala., 5-7 Oct. 1971, Sponsored By the Soc. of Aerospace Mater. and Process Engr.

Descriptors: *Environmental control, *Oxidation resistance, *Protective coatings, *Space shuttles, *Thermal protection, Heat resistant alloys, Metallurgy, Thermodynamic properties

N71-28904 NTIS Prices: PC$3.00 MF$0.95

An Experimental Investigation of Three Balloon-Type Enclosures for Thermal Control of Satellites

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Sweet, G. E.
A2795G4 Fld: 13A, 69A STAR0916
Jun 71 47
Rept No: NASA-TN-D-6224, L-7015
Contract: 124-09-26-03

Descriptors: *Balloons, *Satellite configurations, *Thermal protection, *Thermal vacuum tests, Inflatable spacecraft, Manned orbital telescopes, Radiometers, Skin temperature (non-biological), Thermal control coatings

N71-28074 NTIS Prices: PC$3.00 MF$0.95

The Effects of Charged Particle and Uv Radiation on the Stability of Silvered and Aluminized Fep Teflon Second Surface Mirrors

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Wappaus, W. A.
A2724D1 Fld: 20H, 80J STAR0915
May 71 25p
Rept No: NASA-TM-X-65559, X-762-71-192
Contract: NAS5-11326
Prep- Prepared in Part By Electromech. Res., Inc., College Park, Md.

Descriptors: *Charged particles, *Radiation dosage, *Teflon (trademark), *Thermal control coatings, *Ultraviolet radiation , Aluminum, Electrons, Irradiation, Protons, Silver, Solar constant

N71-27736 NTIS Prices: PC$3.00 MF$0.95

Thermal and Radiative Property Measurement of Thermal Control Coatings by Cyclic Radiation

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Jack, J. R., Spisz, E. W.
A2435J1 Fld: 11C, 71E STAR0912
Apr 71 20p
Rept No: NASA-TN-D-6316, E-6110
Contract: 124-09

Descriptors: *Specific heat, *Thermal control coatings, *Thermal radiation, Absorption spectra, Mathematical models, Paints, Spectral emission, Substrates

Identifiers: NASA subject code 33

N71-24200 NTIS Prices: PC$3.00 MF$0.95

THE APPLICATION OF THERMOELECTRIC DEVICES AS SPACECRAFT THERMAL CONTROL COATINGS

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Clemons, J. M., Krupnick, A. C.
A2145A3 Fld: 11C, 10B, 71E, 67G STAR0909
25 Feb 71 26p
Rept No: NASA-TM-X-64570

Descriptors: *Semiconductor devices, *Spacecraft reliability, *Thermal control coatings, *Thermoelectric materials, Bismuth tellurides, Thin films

Identifiers: NASA subject code 18

N71-19733 NTIS Prices: PC$3.00 MF$0.95

REPORT ON THE FLIGHT PERFORMANCE OF THE Z-93 WHITE PAINT USED IN THE SERT 2 THERMAL CONTROL SYSTEM

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Smolak, G. R., Stevens, N. J.
A2144J4 Fld: 11C, 71E STAR0909
1971 13p
Rept No: NASA-TM-X-52970, E-6177
Conf- Proposed for Presentation At the 6th Thermophysics Conf., Tullahoma, Tenn., 26-28 Apr. 1971, Sponsored By Aiaa

Descriptors: *Absorptance, *Sert 2 spacecraft, *Temperature control, Computer programs, Optical properties, Paints, Protective coatings

Identifiers: NASA subject code 18

N71-19681 NTIS Prices: PC$3.00 MF$0.95

DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS TRIANNUAL REPORT, 1 MAY - 30 SEP. 1970

IIT Research Inst., Chicago, Ill. Technology Center.
Zerlaut, G. A.
A2061F3 Fld: 11C, 71E STAR0908
30 Nov 70 88p
Rept No: NASA-CR-103039, IITRI-U6002-94
Contract: NAS8-5379

Descriptors: *Protective coatings, *Radiation effects, *Temperature control, *Titanium oxides, *Zinc compounds, Paints, Spectral reflectance, Surface properties, Zinc coatings

N71-18484 NTIS Prices: PC$3.00 MF$0.95

The Influence of Environment and the Surface Layer on Crack Propagation and Cyclic Behavior

Martin Marietta Corp Denver Colo Denver Div (403225)

Annual rept.
Kramer, I. R., Kumar, A.
A1794E2 Fld: 20K, 11F, 80O, 71N GRAI7108
Feb 71 59p
Rept No: MCR-71-57
Contract: F44620-69-C-0065
Project: AF-9768
Task: 976802
Monitor: AFOSR-TR-71-0555
Report on Effect of Vacuum Environment on Mechanical Behavior.

Abstract: The paper shows that environment has a marked effect on the surface layer stress, and in turn the surface layer has a large influence on crack propagation and cyclic work hardening and softening. The relaxation and formation of the surface layer controls the cyclic creep behavior. In particular, measurements of the surface layer stress during cyclic hardening and softening demonstrated that the change in the applied stress was equal to the change in the surface layer stress. The decrease in the cyclic hardening of specimen deformed in vacuum can be explained on the basis that the surface layer stress is less for specimens deformed in vacuum than for those deformed in air. It was found that media that cause stress corrosion cracking also increase the surface layer stress. An increase in the surface layer stress was found to increase the crack propagation rate. (Author)

Descriptors: (*Creep, Controlled atmospheres), Stresses, Crack propagation, Aluminum alloys, Titanium alloys, Heat of activation, Vacuum, Stress corrosion, Fatigue(Mechanics)

Identifiers: Aluminum alloy 7075, Titanium alloys 6Al 4V

AD-719 870 NTIS Prices: PC$3.00 MF$0.95

Thermal Control Surface Research at the Royal Aircraft Establishment

Royal Aircraft Establishment, Farnborough (England).
Smith, A. E.
A1554F3 Fld: 22B, 84G STAR0902
Nov 68 37p
Rept No: RAE-TR-68276

Descriptors: *Aerospace engineering, *Control surfaces, *Space environment simulation, *Spacecraft electronic equipment, *Temperature control, Great britain, Systems engineering

N71-11136 NTIS Price: PC$3.00

Preparation of Pigments for Space-Stable Thermal Control Coatings, May 1969 - June 1970

Ohio State Univ. Research Foundation, Columbus.
Campbell, W. B., Cochran, J. K., Ezis, A. , Hinton, J. W., Nychas, S. G.
A1392G2 Fld: 11C, 71E STAR0824
Jul 70 74p
Rept No: NASA-CR-102870
Contract: NAS8-21317

Descriptors: *Aerospace environments, *Pigments, *Protective coatings, *Thermal protection, Aluminum oxides, Nucleation, Rutile, Vapor phases

N70-41984 NTIS Prices: PC$3.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, 1 JAN. - 30 APR. 1970

IIT Research Inst., Chicago, Ill. Technology Center.
Gilligan, J. E., Zerlaut, G. A.
A1095D1 Fld: 11C, 14B, 71E, 73D STAR0820
1 Jul 70 61p
Rept No: NASA-CR-102826, IITRI-U6002-90
Contract: NAS8-5379

Descriptors: *Protective coatings, *Solar wind, *Space simulators, *Thermal protection, Irradiation, Magnetic fields, Proton beams, Radiation effects, Solar protons, Solar simulation, Systems engineering, Zinc coatings

N70-37388 CFSTI Prices: HC$3.00 MF$0.65

MECHANISMS OF RECOVERY OF RADIATION DAMAGED SILICATE-TREATED ZINC OXIDE THERMAL CONTROL COATINGS

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Bass, J. A., Colony, J. A.
A0871F3 Fld: 11C, 18H, 71L, 71E STAR0817
Jun 70 16p
Rept No: NASA-TM-X-63965, X-713-70-251

Descriptors: *Materials recovery, *Protective coatings, *Silicone resins, *Thermal insulation, *Zinc oxides, Bleaching, Near infrared radiation, Photolysis, Radiation damage, Reflectance, Thermosetting resins, X ray irradiation

N70-33138 CFSTI Prices: HC$3.00 MF$0.65

DEVELOPMENT OF SPACE STABLE, LOW SOLAR ABSORPTANCE, PIGMENTED THERMAL CONTROL COATINGS FINAL REPORT, 17 OCT. 1968 - 16 OCT. 1969

IIT Research Inst., Chicago, Ill. Technology Center.
Brzuskiewicz, J. , Gilligan, J. E., Yamate, G. , Zerlaut, G. A.
A0793G2 Fld: 11C, 71E STAR0816
15 Nov 69 192p
Rept No: NASA-CR-66917, IITRI-C6166-12
Contract: NAS1-8166

Descriptors: *Paints, *Solar radiation, *Spectral reflectance, *Temperature control, Absorptance, Charged particles, Ultraviolet radiation

N70-30822 CFSTI Prices: HC$3.00 MF$0.65

DISCRETE CONTROL OF LINEAR DISTRIBUTED SYSTEMS WITH APPLICATION TO THE DEFORMABLE PRIMARY MIRROR OF A LARGE ORBITING TELESCOPE

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Creedon, J. F.
A0725E2 Fld: 3A, 54B STAR0815
1970 111p
Rept No: NASA-TM-X-62960

Descriptors: *Astronomical telescopes, *Discrete functions, *Linear systems, Differential equations, Equations of motion, Excitation, Surface distortion, Systems engineering, Temperature gradients

N70-30532 CFSTI Prices: HC$3.00 MF$0.65

THERMOPHYSICS RESEARCH AT MSFC

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A0654B4 Fld: 11C, 71E STAR0814
1969 103p
Rept No: NASA-TM-X-53820, REPT-6
Conf- Papers Presented At Huntsville, Ala., 30 Jan. 1969 Seri-Its Res. Achievements Rev., Vol. 3, No. 6

Descriptors: *Protective coatings, *Spacecraft structures, *Temperature control, Heat balance, Infrared radiation, Paints, Pigments, Solar energy, Spacecraft design

N70-29006 CFSTI Prices: HC$3.00 MF$0.65

THE PREPARATION AND SPACE ENVIRONMENT BEHAVIOR OF A SILICATE-TREATED ZINC OXIDE THERMAL CONTROL COATING - 101

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Colony, J. A.
A0651D4 Fld: 11C, 71E STAR0814
May 70 13p
Rept No: NASA-TM-X-63935, X-713-70-194

Descriptors: *Protective coatings, *Spacecraft shielding, *Thermal insulation, *Zinc oxides, Aerospace environments, Control surfaces, Radiation effects

N70-28727 CFSTI Prices: HC$3.00 MF$0.65

DEVELOPMENT OF SPACE STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, 1 OCT. - 31 DEC. 1969

IIT Research Inst., Chicago, Ill. Technology Center.
Ashford, N. A., Zerlaut, G. A.
A0642H2 Fld: 11C, 71E STAR0814
20 Feb 70 54p
Rept No: NASA-CR-102654, IITRI-U6002-85
Contract: NAS8-5379

Descriptors: *Protective coatings, *Space environment simulation, *Thermal stability, Irradiation, Paints, Surface reactions, Titanates, Zinc compounds

N70-28082 CFSTI Prices: HC$3.00 MF$0.65

A METHOD OF TREATING THE NON-GREY ERROR IN TOTAL EMITTANCE MEASUREMENTS

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Heaney, J. B., Henninger, J. H.
A0571E2 Fld: 14B, 73D STAR0813
Jan 70 23p
Rept No: NASA-TM-X-63903, X-713-70-28

Descriptors: *Error analysis, *Metal coatings, *Spectral emission, *Surface temperature, *Temperature control, Infrared spectra, Instrument compensation

N70-27320 CFSTI Prices: HC$3.00 MF$0.65

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS, 1 MAY - 30 SEPTEMBER 1969

IIT Research Inst., Chicago, Ill.
Ashford, N. A., Zerlaut, G. A.
A0565A3 Fld: 11C, 71E STAR0813
17 Nov 69 37p
Rept No: NASA-CR-102653, IITRI-U6002-83
Contract: NAS8-5379

Descriptors: *Protective coatings, *Titanium compounds, *Zinc oxides, Chemical reactions, Electron paramagnetic resonance, Irradiation, X ray diffraction

N70-27168 CFSTI Prices: HC$3.00 MF$0.65

THE DEVELOPMENT OF HXW THERMAL COATING

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Harwell, R. J.
A0075C1 Fld: 11C, 22B, 920, 944 STAR0807
16 Jan 69 12p
Rept No: NASA-TM-X-53985

Descriptors: *Aerospace environments, *Protective coatings, *Spacecraft shielding, *Temperature control, Optical properties, Solar radiation

N70-18850 CFSTI Prices: HC$3.00 MF$0.95

EXPERIMENTAL STUDY OF EFFECTS OF SIMULATED NEUTRALIZED SOLAR WIND ON WHITE-PIGMENT THERMAL CONTROL COATINGS

Boeing Co., Seattle, Wash. Aerospace Group.
Cannaday, S. S., Fogdall, L. B., Madaras, B. K., Reinke, F. D.
7282A4 Fld: 11C, 920 STAR0803
Oct 69 59p
Rept No: NASA-CR-73389
Contract: NAS2-5343

Descriptors: *Primers (coatings), *Radiation effects, *Solar wind, *Space environment simulation, Paints, Space flight, Temperature control, Thermal protection, Ultraviolet reflection

N70-12934 CFSTI Prices: HC$6.00 MF$0.95

PREPARATION OF PIGMENTS FOR SPACE-STABLE THERMAL CONTROL COATINGS INTERIM SUMMARY REPORT, 1 JUN. 1968 - 30 APR. 1969

Ohio State Univ. Research Foundation, Columbus.
Burroughs, J. E., Campbell, W. B., Cochran, J. K., Hinton, J. W., Randall, J. W.
7215E1 Fld: 11C, 920 STAR0802
Jul 69 90p
Rept No: NASA-CR-102365
Contract: NAS8-21317

Descriptors: *Nucleation, *Pigments, *Reaction kinetics, *Vapor phases, Aluminum oxides, Ceramics, Rutile, Solar radiation, Space environment simulation, Thermal stability, Zinc compounds

N70-12310 CFSTI Prices: HC$6.00 MF$0.95

EXPLORATOR HEAT-TRANSFER MEASUREMENTS AT MACH 10 ON A 7.5 DEG TOTAL-ANGLE CONE DOWNSTREAM OF A REGION OF AIR AND HELIUM TRANSPIRATION COOLING

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Dunavant, J. C., Everhart, P. E.
7214L3 Fld: 20M, 932 STAR0802
Dec 69 31p
Rept No: NASA-TN-D-5554, L-6161
Contract: 124-07-12-04-23

Descriptors: *Aerodynamic heating, *Heat transfer, *Sweat cooling, *Thermodynamic properties, Air, Helium, Mach number, Porous boundary layer control, Surface reactions, Transition flow, Turbulent flow

N70-12278 CFSTI Prices: HC$6.00 MF$0.95

EFFECT OF ENVIRONMENT ON THERMAL CONTROL COATINGS FINAL REPORT

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Stanford Research Inst., Menlo Park, Calif.
Morrison, S. R., Sancier, K. M.
7212F1 Fld: 11C, 920 STAR0802
15 Oct 69 121p
Rept No: NASA-CR-106996
Contract: NAS7-100, JPL-951522
Prep- Prepared for Jpl

Descriptors: *Photodecomposition, *Protective coatings, *Temperature control, *Thermal degradation, *Zinc oxides, Charge carriers, Electron capture, Hole mobility, Photoproduction, Single crystals, Ultraviolet radiation, Vacuum

N70-12016 CFSTI Prices: HC$6.00 MF$0.95

ISOTHERMAL COVER WITH THERMAL RESERVOIRS PATENT APPLICATION

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Byrd, A. W.
7145D4 Fld: 13A, 916 STAR0801
30 Jul 69 12p
Rept No: NASA-CASE-MFS-20355, US-PATENT-APPL-SN-845974

Descriptors: *Heat sinks, *Isothermal layers, *Protective coatings, *Spacecraft instruments, *Temperature control, Patent applications, Thermal insulation

N70-11149 CFSTI Prices: HC$3.00 MF$0.95

THERMAL CONTROL SURFACES

European Space Research and Technology Center, Noordwijk (Netherlands).
Downey, M. J., Schamle, G.
6945E3 Fld: 22B, 20M, 944 STAR0722
Feb 69 30p
Rept No: ESRO-TN-73
Coll- 30 P Refs Conf- Presented At the 6th Esro Summer School. Noordwijk, Neth., 1968

Descriptors: *Absorptance, *Heat balance, *Reflectance, *Spacecraft environments, *Thermal radiation, Control, Emittance, Radiation shielding, Solar simulation, Spacecraft structures, Surface temperature, Thermal environments, Thin films

N69-37549 CFSTI Prices: HC$6.00 MF$0.95

THE DETERMINATION OF SURFACE TEMPERATURES

European Space Research and Technology Center, Noordwijk (Netherlands).
Janes, M.
6944J1 Fld: 14B, 945 STAR0722
Feb 69 33p
Rept No: ESRO-TN-78
Coll- 33 P Refs Conf- Presented At the 6th Esro Summer School. Noordwijk, Neth., 1968

Descriptors: *Surface temperature, *Temperature measuring instruments, *Thermal radiation, *Thermistors, *Thermocouples, Black body radiation, Conferences, Emissivity, Infrared radiation, Isotherms, Radiation laws, Temperature control, Temperature measurement

N69-37466 CFSTI Prices: HC$6.00 MF$0.95

DETERMINATION OF THE THERMAL BEHAVIOUR OF A SATELLITE

European Space Research and Technology Center, Noordwijk (Netherlands).

Determination Du Comportement Thermique D'un Satellite
Toussaint, M.
6943K3 Fld: 22B, 944 STAR0722
Feb 69 48p
Rept No: ESRO-TM-107
Coll- 48 P Refs Lang- in French, English Summary Conf-Presented At the Esro Summer School, Noordwisk, Neth., 1968

Descriptors: *Aerospace environments, *Artificial satellites, *Temperature measurement, *Thermal environments, *Thermal simulation, Conferences, Error analysis, Mathematical models, Solar radiation, Surface properties, Temperature control

N69-37389 CFSTI Prices: HC$6.00 MF$0.95

PRESSURES AND HEAT TRANSFER ON A 75 DEGREE SWEPT DELTA WING WITH TRAILING-EDGE FLAP AT MACH 6 AND ANGLES OF ATTACK TO 90 DEGREES

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Keyes, J. W.
6941F1 Fld: 1C, 1A, 20D, 902, 901 STAR0720
Sep 69 46p
Rept No: NASA-TN-D-5418
Contract: 126-13-10-19-23

Descriptors: *Delta wings, *Heat transfer, *Pressure distribution, *Trailing-edge flaps, Angle of attack, Flaps (control surfaces), Reynolds number, Shock wave interaction

N69-35855 CFSTI Prices: HC$6.00 MF$0.95

MACROLAMINATE PARTICLE COMPOSITE MATERIAL DEVELOPMENT

Boeing Co., Seattle, Wash. (059 600)

Interim rept. no. 6, 1 Feb-1 Apr 65
Simpson, F. H., Stejskal, L.
6811E4 Fld: 11D, 920 USGRDR6924
Apr 65 16p
Contract: NOw-64-0194
See also Interim rept. no. 5, AD-457 992. Distribution Limitation now Removed.

Abstract: The report describes work accomplished on the development of macrolaminate particle composites. Specimens made from cubical shaped particles had better oxidation resistance and higher compressive strength than those made using plate-like particles. Specimens made using rectangular shaped particles with one axis elongated have nearly comparable oxidation and compressive properties to those made from cubical particles and have higher flexural strength. Flexural strength, compressive deformation and weight loss due to oxidation increase with increasing metal content in the composite. The rate of weight loss due to oxidation increases with increasing metal content. Results from hot pressing, isostatic pressing and warm pressing experiments are summarized. Substantial improvements in sintering of the composite have not been realized either by increasing pressure in the vacuum furnace or through use of wet hydrogen. Yielding in flexural specimens prior to ultimate failure was obtained in specimens sintered in wet hydrogen and not in those sintered in vacuum. (Author)

Descriptors: (*Composite materials, *Laminates). Heat-resistant materials. Molybdenum. Ceramic coatings. Oxides, Magnesium compounds, Dioxides, Hafnium compounds. Cerium compounds, Deformation, Compressive properties, Oxidation. Failure(Mechanics), Creep, Material forming, Hot working. Controlled atmospheres. Hydrogen, Sintering, Vacuum furnaces. Particle size, Flexural strength, Hot pressing

Identifiers: Hafnium dioxide, Cerium dioxide, Magnesium oxides, Warm working

AD-462 748 CFSTI Price: HC$3.00

DEVELOPMENT OF SERIES EMITTANCE THERMAL CONTROL COATINGS FINAL REPORT, SEP. 1968 - JUN. 1969

General Electric Co., Philadelphia, Pa. Missile and Space Div.
Griffin, R. N., Linuer, B.
6785J3 Fld. 11C, 920 STAR0720
Jun 69 35p
Rept No: NASA-CR-66820
Contract: NAS1-8603

Descriptors: *Dielectric properties, *Magnetic films, *Protective coatings, *Thermal radiation, Film thickness, Silicones, Teflon (trademark), Thermal emission, Vacuum

N69-35480 CFSTI Prices: HC$6.00 MF$0.95

INORGANIC THERMAL CONTROL COATINGS

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Krupnick, A. C.
6711D1 Fld: 11C, 920 STAR0719
3 Apr 69 15p
Rept No: NASA-CASE-MFS-20011, US-PATENT-APPL-SN-813338

Descriptors: *Inorganic coatings, *Protective coatings, *Solar radiation shielding, *Temperature control, *Thermal protection, Optical properties, Patent applications, Pigments, Sprayed coatings

N69-33483 CFSTI Prices: HC$3.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, 1 AUG. - 31 OCT. 1967

IIT Research Inst., Chicago, Ill. Technology Center.
Noble, G. , Rogers, F. O., Zerlaut, G. A.
6564K4 Fld: 11C, 22B, 920, 944 STAR0717
15 Jan 68 81p
Rept No: NASA-CR-102216, IITRI-U6002-59
Contract: NAS8-5379

Descriptors: *Protective coatings, *Spacecraft structures, *Thermal protection, *Zinc oxides, Heat shielding, Methyl compounds, Paints, Pigments, Silicon compounds

N69-31335 CFSTI Prices: HC$6.00 MF$0.95

STUDY OF SPACE ENVIRONMENT EFFECTS ON THERMAL CONTROL COATINGS - DEPENDENCE OF THERMAL CONTROL COATING DEGRADATION UPON ELECTRON ENERGY FINAL REPORT

Boeing Co., Seattle, Wash. Aerospace Group.
Cannaday, S. S., Fogdall, L. B.
6555B4 Fld: 11C, 920 STAR0717
May 69 125p
Rept No: NASA-CR-103205, D2-126114-1
Contract: NAS5-11164

Descriptors: *Coatings, *Electrons, *Temperature control, *Vacuum, Aluminum, Data processing, Graphs (charts), Teflon (trademark)

N69-30549 CFSTI Prices: HC$6.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, 1 NOV. 1967 - 29 FEB. 1968

IIT Research Inst., Chicago, Ill. Technology Center.
Noble, G. , Zerlaut, G. A.
6494H3 Fld. 11C, 920 STAR0716
15 Apr 68 37p
Rept No: NASA-CR-102203, IITRI-U6002-63
Contract: NAS8-5379, IITRI PROJ. U6002

Descriptors: *Encapsulating, *Paints, *Protective coatings, *Radiation shielding, *Spacecraft construction materials, *Zinc compounds, Resins, Surface layers, Thermal degracation, Titanates

N69-29596 CFSTI Prices: HC$6.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, 1 MAR. - 31 AUG. 1968

IIT Research Inst., Chicago, Ill. Technology Center.
Marcour, M. , Noble, G. , Zerlaut, G. A.
6493H4 Fld: 11C, 22B, 920, 944 STAR0716
25 Oct 68 86p
Rept No: NASA-CR-101580, IITRI-U6002-69
Contract' NAS8-5379

Descriptors: *Aerospace environments, *Coatings, *Control surfaces, *Thermal radiation, *Titanates, *Zinc compounds, Gamma rays, Optical properties, Pigments, Proton beams, Reflectometers, Ultraviolet radiation

N69-29346 CFSTI Prices: HC$6.00 MF$0.95

DEVELOPMENT WORK FOR A SEMIACTIVE TEMPERATURE CONTROL SYSTEM. PART 2 - DEVELOPMENT AND TESTING OF SHUTTER

Dornier-werke G.M.B.H., Friedrichshafen (West Germany).

Entwicklungsarbeiten An Einem Halbaktiven Temperatur-regelsystem. Teil 2 - Entwicklung Und Erprobung Von Blendensystemen
Bey, R. , Hermann, E. , Kalkbrenner, B. , Sinreich, G.
6441A3 Fld: 22B, 944 STAR0715
Nov 68 75p
Rept No: BMWF-FB-W-68-75
Refs Lang- in German, English Summary Spon- Sponsored By Bundesmin. Fuer Wiss. Forsch.

Descriptors: *Louvers, *Reflectance, *Satellite design, *Temperature control, *Temperature sensors, Aging (metallurgy), Aluminum coatings, Degradation, Micrometeoroids, Optical properties, Solar constant, Solar radiation, Solar simulation, Space environment simulation, Sprayed coatings, Thermal absorption, Thermal emission

N69-27915 CFSTI Prices: HC$6.00 MF$0.95

IN SITU ELECTRON, PROTON, AND ULTRAVIOLET RADIATION EFFECTS ON THERMAL CONTROL COATINGS FINAL REPORT

Boeing Co., Seattle, Wash. Aerospace Group.
Brown, R. R., Cannaday, S. S., Fogdall, L. B.
6325C4 Fld: 11C, 920 STAR0713
1968 48p
Rept No: NASA-CR-100840, D2-84118-9
Contract: NAS5-9650

Descriptors: *Coatings, *Electron radiation, *Protons, *Temperature control, *Ultraviolet radiation, Irradiation, Solar spectra, Vacuum

N69-24925 CFSTI Prices: HC$6.00 MF$0.95

A STUDY OF ENVIRONMENTAL EFFECTS UPON PARTICULATE RADIATION-INDUCED ABSORPTION BANDS IN SPACECRAFT THERMAL CONTROL COATING PIGMENTS FINAL REPORT, 22 MAY 1967 - 27 JAN. 1969

Lockheed Missiles and Space Co., Palo Alto, Calif. Aerospace Sciences Lab.
Douglas, N. J., Greenberg, S. A., Mc Cargo, M.
6324J1 Fld: 11B, 920 STAR0713
Apr 69 15p
Rept No: NASA-CR-73318
Contract: NAS2-4353

Descriptors: *Absorption spectra, *Radiation effects, *Solar wind, *Spacecraft environments, *Temperature control, Coatings, Environment simulation, Metal oxides, Potassium silicates, Proton energy, Thin films, Ultraviolet radiation

N69-24825 CFSTI Prices: HC$3.00 MF$0.95

IN SITU ELECTRON, PROTON, AND ULTRAVIOLET RADIATION EFFECTS ON THERMAL CONTROL COATINGS FINAL REPORT, 15 SEP. 1965 - 15 JUL. 1968

Boeing Co., Seattle, Wash. Aerospace Group.
Brown, R. R., Cannauay, S. S., Fogdall, L. B.
6265F2 Fld: 11C, 920 STAR0712
Jul 68 149p
Rept No: NASA-CR-100146
Contract: NAS5-9650

Descriptors: *Coatings, *Radiation effects, *Temperature control, Aluminum coatings, Electron radiation, Monochromators, Proton irradiation, Silicones, Ultraviolet radiation, Vacuum

N69-23865 CFSTI Prices: HC$6.00 MF$0.95

THERMAL CONTROL SURFACE RESEARCH AT THE ROYAL AIRCRAFT ESTABLISHMENT

Royal Aircraft Establishment Farnborough (England) (310450)

Technical rept.
Smith, A. E.
6244D1 Fld: 22B, 20M, 944 USGRDR6915
Nov 68 37p
Rept No: RAE-TR-68276

Abstract: The report defines four basic classes of thermal control surface and the research being carried out on each type of surface. Details are given of the apparatus used to measure the reflectance properties of the surfaces and the facilities available to simulate the space environment. Finally, a description is given of the preliminary design of a satellite-borne experiment designed to test thermal control surfaces in space. (Author)

Descriptors: (*Satellites(Artificial), Thermal stresses), Thermal stability, Surface properties, Space environmental conditions, Reflectivity, Degradation, Plastic paints, Pigments, Vacuum, Life expectancy, Ultraviolet radiation, Photon bombardment, Great Britain

AD-688 908 CFSTI Prices: HC$6.00 MF$0.95

SHAFT FACE SEAL WITH SELF-ACTING LIFT AUGMENTATION FOR ADVANCED GAS TURBINE ENGINES

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Johnson, R. L., Ludwig, L. P.
6153G4 Fld: 21E, 11A STAR0711
Apr 69 23p
Rept No: NASA-TN-D-5170
Contract: 126-15-02-27-22

Descriptors: *Automatic control, *Gas turbine engines, *Lift augmentation, *Seals (stoppers), *Shafts (machine elements), Deformation, High pressure, High speed, High temperature, Interfacial tension, Leakage, Sliding friction, Surface properties, Systems engineering

N69-23232 CFSTI Prices: HC$6.00 MF$0.95

SURVEY OF THERMAL CONTROL TECHNIQUES FOR EXTRAVEHICULAR SPACE SUITS

IIT Research Inst Chicago Ill (175350)

Final rept. 1 Mar 66-1 Mar 68
Hedge, Jack C.
6113H3 Fld: 6Q, 6E, 22A USGRDR6913
Dec 68 28p
Rept No: IITRI-J6028-1
Contract: AF 33(615)-3468
Project: AF-7164
Task: 716411
Monitor: AMRL-TR-68-87

Abstract: 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)

Descriptors: (*Pressure suits, *Thermal insulation), (*Extravehicular activity, Pressure suits), Thermal properties, Thermal stability, Astronauts, Protective clothing, Space environmental conditions, Heat, Temperature, Solar radiation, Albedo, Spacecraft, Orbital trajectories, Thermal conductivity , Surface properties, Mobility, Gloves, Touch, Design, Metabolism, Body temperature, Body fluids, Heat production(Biology)

AD-687 149 CFSTI Prices: HC$6.00 MF$0.95

THE ORIGIN OF DEPOSITS FORMED ON THE SURFACE OF THERMAL CONTROL MATERIALS BY THE ACTION OF EXTREME ULTRAVIOLET RADIATION

Air Force Flight Dynamics Lab Wright-Patterson AFB Ohio (012070)

Technical rept. Jul 65-Apr 68
Mangold, Vernon L.
6043H2 Fld: 11C USGRDR6912
Feb 69 30p
Rept No: AFFDL-TR-68-155
Project: AF-7340

Abstract: The phenomenon of surface deposits formed on selected white thermal control samples during extreme ultraviolet irradiation has been investigated. Information obtained in this experimental program indicates that the surface deposit was unique to the coating sample and not the result of the environmental chamber system contamination. (Author)

Descriptors: (*Organic coatings, Ultraviolet radiation), Spacecraft, Thermal radiation, Space simulation chambers, Emissivity, Absorption, Reflectivity, Deposits

Identifiers: Reflective coatings

AD-686 428 CFSTI Prices: PC$6.00 MF$0.95

EFFECT OF ENVIRONMENT ON THERMAL CONTROL COATINGS

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Stanford Research Inst., Menlo Park, Calif.
Freund, T. , Morrison, S. R., Sancier, K.
5935K3 Fld: 11C STAR0708
3 Dec 68 62p
Rept No: NASA-CR-100210, IR-2
Contract: NAS7-100, JPL-951522
Prep- Prepared for Jpl

Descriptors: *Iron cyanides, *Optical properties, *Ultraviolet radiation, *Vacuum effects, *Zinc coatings, Additives, Chemical reactions, Electromagnetic absorption, Ferrites, Ferrocenes, Iron compounds, Photoelectric effect

N69-19561 CFSTI Prices: PC$6.00 MF$0.95

A METHOD FOR REDUCING THE EQUIVALENT SINK TEMPERATURE OF A VERTICALLY ORIENTED RADIATOR ON THE LUNAR SURFACE

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Bien, D. D., Guentert, D. C.
5845G3 Fld: 22A STAR0707
Jan 69 17p
Rept No: NASA-TM-X-1729
Contract: 120-27-06-10-22

Descriptors: *Coverings, *Heat radiators, *Heat sinks, *Lunar topography, *Temperature control, Absorptance, Heat transfer, Mathematical models, Mylar (trademark), Plastics, Rankine cycle, Thermionic emission

N69-17225 CFSTI Prices: PC$3.00 MF$0.95

EFFECT OF VARIOUS CHEMICALS ON THERMOGRAVIMETRIC ANALYSIS OF PONDEROSA PINE

Forest Products Lab., Madison, Wis. (141 700)
Browne, R. L., Tang, W. K.
5825B2 Fld: 11L USGRDR6909
Jun 63 20p
Distribution Limitation now Removed.

Abstract: Thermogravimetric analyses of thin shavings of ponderosa pine, untreated and treated with 33 chemicals, were performed in vacuum and in nitrogen within the temperature range of 25 to 400 C. Results were classified in accordance with the threshold decomposition temperature for the pyrolysis reaction of the wood samples, and the degrees of volatilization at 250, 300, 350, and 400 C.

Descriptors: (*Wood, *Thermogravimetric analysis), Heating, Fire resistant coatings, High-temperature research, Heat-resistant materials, Effectiveness, Boron compounds, Test equipment, Test methods, Controlled atmospheres, Nitrogen, Low-pressure research, Vacuum apparatus, Chlorides, Fluorides, Nitrates, Halides, Phosphates, Sulfates, Carbonates

Identifiers: Ponderosa pine, Fire retardants

AD-411 262 CFSTI Prices: PC$6.00 MF$0.95

EXPLORATORY EXPERIMENTAL STUDY ON NEUTRAL CHARGE LOW ENERGY PARTICLE IRRADIATION OF SELECTED THERMAL CONTROL COATINGS

Martin Co., Denver, Colo.
Farnsworth, D.
578384 Fld: 11C STAR0706
Jan 69 24p
Rept No: NASA-CR-73290
Contract: NAS2-4962

Descriptors: *Aluminum coatings, *Neutral beams, *Radiation effects, *Space environment simulation, *Thermal protection, *Zinc coatings, Bleaching, Environmental tests, Spacecraft shielding, Spectral reflectance, Thermal stability

N69-16965 CFSTI Prices: PC$6.00 MF$0.95

STUDY OF ENVIRONMENTAL EFFECTS UPON PARTICULATE RADIATION INDUCED ABSORPTION BANDS IN SPACECRAFT THERMAL CONTROL COATING PIGMENTS FINAL REPORT, 22 MAY 1967 - 27 JAN. 1969

Lockheed Missiles and Space Co., Palo Alto, Calif. Thermophysics Lab.
5782F3 Fld: 11C, 22B STAR0706
27 Jan 69 111p
Rept No: NASA-CR-73289, REPT-6-78-68-45
Contract: NAS2-4353

Descriptors: *Charged particles, *Electromagnetic radiation, *Environmental tests, *Optical properties, *Solar radiation, *Spacecraft structures, *Temperature control, Absorption spectra, Aerospace environments, Lanthanum oxides, Potassium silicates, Protective coatings, Protons, Ultraviolet radiation, Zinc oxides

N69-16868 CFSTI Prices: PC$6.00 MF$0.95

STRUCTURAL THERMAL-CONTROL COATINGS

National Aeronautics and Space Administration Washington, D. C. Technology Utilization Div.
5763A3 Fld: 11C, 22D USGRDR6908
1968 35p
Part of technical support package for Tech Brief 68-10553.

Descriptors: (*Coatings, Temperature control), (*Space surveillance systems, Telemetering antennas), (*Telemetering antennas, Protective treatments), Thermal insulation, Corrosion inhibition, Structural parts, Deflection, Thermal radiation, Solar radiation, Paints, Paint applicators, Surface properties, Aging(Materials)

Identifiers: DSIF(Deep Space Instrumentation Facility), Deep space instrumentation facility

PB-182 493 CFSTI Prices: PC$6.00 MF$0.95

CONTROLLED ATMOSPHERE FIRING FOR FORMATION OF BARRIER-LAYER DIELECTRICS

Army Electronics Command Fort Monmouth N J (037620)

Technical rept.
Wichansky, Howard
5541B3 Fld: 13H, 11C, 11G USGRDR6905
Nov 68 18p
Rept No: ECOM-3044
Project: DA-1-T-062105-A-348
Task: 1-T-062105-A-34833

Abstract: A new process was devised for producing barrier-layer dielectrics from high purity barium titanate. The process developed permits the formation of a dielectric with high capacitance per unit volume by a one-fire treatment with the use of controlled atmosphere in place of three separate firings presently required. A barrier-layer dielectric was produced that had a capacitance of 3400 picofarads in a bulk volume of 0.0062 cu in and dissipation factor of 0.035 at 1 kHz and room temperature. The capacitor demonstrated only a 20 percent decrease in capacitance with a 300-volt d.c. applied potential. (Author)

Descriptors: (*Dielectric films, Manufacturing methods), Barium compounds, Titanates, Heat treatment, Controlled atmospheres, Barrier coatings, Ceramic coatings, Processing, Vacuum furnaces, Capacitance, Voltage, Stability

Identifiers: Firing, Barium titanates

AD-680 193 CFSTI Prices: PC$3.00 MF$0.95

DETERMINATION OF WICKING PROPERTIES OF COMPRESSIBLE MATERIALS FOR HEAT PIPE APPLICATIONS

Aerospace Corp El Segundo Calif Lab Operations (009575)

Rept. for Mar 67-Mar 68
Farran, R. A., Starner, K. E.
5494H4 Fld: 11E, 20M, 22B USGRDR6904
Jul 68 51p
Rept No: TR-0200(4240-10)-7
Contract: F04701-68-C-0200
Monitor: SAMSO-TR-68-428

Abstract: An experimental program was conducted to develop techniques for determining the wicking characteristics of nonrigid materials for potential use in heat pipes. The principal quantities of interest are effective pore size (to calculate a driving potential for capillary pumping of liquids) and permeability (to establish resistance to liquid flow). Compressible wicking materials do not readily lend themselves to some of the more conventional procedures used for determining flow properties as, e.g., in measuring permeability by forcing a liquid through a rigid, porous material after which flow rate and pressure drop measurements are used to calculate permeability. Consequently, other methods were investigated. Experiments were conducted with woven sleeving to determine the wicking characteristics mentioned above. Results of these tests are presented and compared with performance predicted from theory. (Author)

Descriptors: (*Space environmental conditions, Controlled atmospheres), (*Heat transfer, Pipes), (*Textiles, Thermal properties), Fluid flow, Porosity, Permeability, Compressive properties, Test methods, Theory, Correlation techniques, Surface tension, Evaporation, Equations of motion, Test equipment, Silicon dioxide

Identifiers: *Capillary flow, *Heat pipes, *Wicks, Wicking properties

AD-679 975 CFSTI Prices: PC$6.00 MF$0.95

HEAT-TRANSFER AND PRESSURE DISTRIBUTIONS INSIDE THE HINGE-LINE GAP OF A WEDGE-FLAP COMBINATION AT MACH NUMBER 10.4

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Dearing, J. D., Hamilton, H. H.
5471B1 Fld: 1A, 20D STAR0701
Nov 68 57p
Rept No: NASA-TN-D-4911

Descriptors: *Flaps (control surfaces), *Gaps, *Heat transfer, *Hinges, *Hypersonic speed, *Pressure distribution, *Wedges, Aerodynamic heating, Angle of attack, Laminar boundary layer, Reynolds number, Turbulent boundary layer

N69-11009 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF A DUCTILE COLUMBIUM ALLOY ROCKET ENGINE COMBUSTION CHAMBER

Marquardt Corp., Van Nuys, Calif. Materials and Process Dept.
Ritchie, E.
5463J4 Fld 21H STAR0701
26 Sep 67 143p
Rept No: NASA-CR-97479, TMC-S-843
Contract: NAS9-6003

Descriptors: *Combustion chambers, *High temperature tests, *Niobium alloys, *Rocket linings, *Silicides, Combustion control, Protective coatings, Refractories, Space environment simulation, Vacuum effects

N69-10781 CFSTI Prices: PC$6.00 MF$0.95

OPTICAL SOLAR REFLECTOR: A HIGHLY STABLE, LOW AS/E SPACECRAFT THERMAL CONTROL SURFACE

Lockheed Missiles and Space Co Palo Alto Calif Lockheed Palo Alto Research Lab (210118)
Marshall, K. N., Breuch, R. A.
5412E2 Fld: 20M, 11C, 22B USGRDR6903
10 Jun 68 6p
Contract: AF 33(615)-5066, NAS2-3063
Revision of manuscript received 16 Oct 67.
Availability: Pub. in Jnl. of Spacecraft and Rockets, v5 n9 p1051-1056 Sep 68.

Abstract: A stable, low AS/E spacecraft thermal control surface has been developed. The material is basically a second-surface mirror composed of silver vacuum deposited on high-purity fused silica which gives AS/E = 0.062 at 295K. Experimental determinations of A/S for 180 and 295K and measurements of E for the temperature range of 83 to 750K are presented. A summary of laboratory simulated exposures to Van Allen proton, artificial electron belt, solar wind proton, solar ultraviolet, and slected combinations of environments is presented and demonstrates that the material is stable. In addition, sinusoidal and random vibration, mechanical shock, and thermal cycling test results are reported which show mechanical integrity for the imposed test conditions. Results of studies to determine suitable application techniques are discussed. The Optical Solar Reflector was found to have the lowest AS/E of any production thermal control coating available; it affords a solution for reliable thermal control of many advanced spacecraft systems. (Author)

Descriptors: (*Spacecraft, *Thermal insulation), (*Optical coatings, Reflectivity), Solar radiation, Mirrors, Spectra(Infrared), Spectra(Visible + ultraviolet), Absorption, Thermal radiation, Stability, Substrates, Particle spectra, Solar flares, Solar wind

Identifiers: *OSR(Optical Solar Reflector), *Optical solar reflectors, Solar absorptance

AD-678 799 CFSTI Prices: PC$3.00 MF$0.95

DEVELOPMENT OF PHASE-CHANGE COATINGS FOR USE AS VARIABLE THERMAL CONTROL SURFACES FINAL REPORT, 8 MAR. 1967 - 8 MAR. 1968

General Electric Co., Philadelphia, Pa. Missile and Space Div.
Griffin, R. N., Linder, B.
5325I1 Fld: 20M, 22B STAR0623
8 Mar 68 71p
Rept No: NASA-CR-66695
Contract: NAS1-6166

Descriptors: *Phase transformations, *Protective coatings, *Spacecraft structures, *Thermal protection, Organic compounds, Plastics, Product development, Space flight, Stearates, Surface properties, Temperature effects

N68-36113 CFSTI Prices: PC$6.00 MF$0.95

ANALYTICAL STUDY OF A SOLAR DEGRADATION MODEL FOR THERMAL CONTROL MATERIALS AND SOME RAMIFICATIONS FOR ACCELERATED SOLAR RADIATION TESTING

Arnold Engineering Development Center Arnold Air Force Station Tenn (042550)

Final rept. Sep 66-Dec 67
Smith, A. M., Lee, A. Y.
5125D3 Fld: 22B, 3B USGRDR6822
Sep 68 40p
Rept No: AEDC-TR-68-175
Contract: F40600-69-C-0001
Project: ARO-ST0802
Prepared in cooperation with ARO, Inc., Tullahoma, Tenn.

Abstract: A photoreaction-diffusion model for the solar degradation of thermal control materials is mathematically formulated and analyzed. The governing differential equation for the concentration of defect specie created in the material by radiation is derived, and an analytical solution is obtained for appropriate boundary conditions. From this solution for the concentration of the ith-type defects, an analytical expression is derived for the number of ith-type defects present in a material layer of depth x and unit irradiated area. These analytical relations are used to predict the radiation-induced increase in the absorption coefficient and absorption optical thickness of a hypothetical thermal control material exposed to damaging ultraviolet irradiance equal to that of the sun. The solutions are also used to better define the environmental parameters which must be controlled during solar radiation testing of thermal control coatings. For example, the time-irradiance reciprocity principle often employed in accelerated solar testing is investigated by use of the aforementioned solutions and is found to be invalid for materials which degrade according to the photoreaction-diffusion model. (Author)

Descriptors: (*Spacecraft, Solar radiation), (*Solar radiation, Degradation), Materials, Thermal properties, Control, Wind tunnel models, Mathematical models, Predictions, Coatings, Ultraviolet radiation, Simulation, Space environmental conditions

Identifiers: *Thermal control materials, Skin(Structural)

AD-675 140 CFSTI Prices: PC$6.00 MF$0.95

CONSOLIDATED SEMIANNUAL PROGRESS REPORT

University of Southern California Los Angeles Electronic Sciences Lab (361620)

Rept. no. 7, 1 Oct 67-31 Mar 68.
5053A2 Fld: 20L, 17B, 9D, 9C, 6B USGRDR6821
1968 214p
See also Rept. no. 6, AD-666 451.

Abstract: Contents: Solid state: Semiconductors; Quantum electrons and lasers; Magnetism; Defects in crystals; High field superconductivity; Metals; Applied electromagnetics and plasmas: Plasmas; Millimeter wave radiometry; Information sciences: Control systems; Communication and radar systems; Switching, automata theory, and computers; Biomedical engineering: Cardiovascular and respiratory systems; Fluid-electrolyte and renal systems; Nervous systems; Neuromuscular systems.

Descriptors: (*Solid state physics, Reports), (*Communication systems, Reports), (*Electrical engineering, Control systems), Semiconductors, Tunneling(Electronics), Gallium arsenides, Coherent radiation, Nuclear magnetic resonance, Cadmium sulfides, Ceramic materials, Superconductors, Grain boundaries, Vapor plating, Vacuum apparatus, Band theory of solids, Lasers, Automata, Radio astronomy, Flight control systems, Seismic waves, Spacecraft, Information theory, Radar signals, Pattern recognition, Plasma medium, Cardiovascular system, Urinary system, Electrolytes(Physiology), Nervous system, Neuromuscular transmission, Electrophysiology, Bionics

Identifiers: Lattice vibrations, Carrier recombination, Quantum electronics, Raman scattering, Nonlinear optics, Fermi surfaces, Optimal control theory, Automata theory, Sequential machines

AD-674 031 CFSTI Prices: PC$6.00 MF$0.95

EFFECT OF HINGE-LINE BLEED ON HEAT TRANSFER AND PRESSURE DISTRIBUTION OVER A WEDGE-FLAP COMBINATION AT MACH 10.4

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Dearing, J. D., Hamilton, H. H.
5033G1 Fld. 1A, 20D STAR0618
Aug 68 46p
Rept No: NASA-TN-D-4686
Contract: 129-01-07-08-23

Descriptors: *Bleeding, *Boundary layer control, *Flaps (control surfaces), *Heat transfer, *Hypersonic speed, *Pressure distribution, *Wedges, Angle of attack, Gaps, Hinges, Lifting bodies, Reynolds number

N68-29955 CFSTI Prices: PC$6.00 MF$0.95

A REVIEW OF THE STATUS OF SPACECRAFT THERMAL CONTROL MATERIALS

National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
Arvesen, J. C., Streed, E. R.
4875D4 Fld: 20M, 22B STAR0615
1967 14p
Rept No: NASA-TM-X-60406
Conf- Presented At the Soc. of Aerospace Mater. and Process Engr. 11th Natl. Symp., St. Louis, 19-21 Apr. 1967

Descriptors: *Spacecraft construction materials, *Temperature control, *Thermophysical properties, Aerospace environments, Bibliographies, Protective coatings, Solar radiation, Ultraviolet radiation

N68-26303 CFSTI Prices: PC$3.00 MF$0.95

IRRADIATION OF THERMAL CONTROL COATINGS FINAL REPORT, FEB. 1967 - FEB. 1968

General Electric Co., Philadelphia, Pa. Missile and Space Div.
Scannapieco, J. F.
4803I2 Fld: 11C, 20M STAR0614
Feb 68 220p
Rept No: NASA-CR-94684, DOC.-68SD4224
Contract: NAS5-11001

Descriptors: *Irradiation, *Oao, *Protective coatings, *Temperature control, Aerospace environments, Charged particles, High vacuum, Micrometeoroids, Mylar (trademark), Paints, Solar cells, Spectral reflectance, Ultraviolet radiation

N68-24465 CFSTI Prices: PC$6.00 MF$0.95

DESIGN, TEST, AND PERFORMANCE OF THE MARINER 5 TEMPERATURE CONTROL REFERENCE

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Carroll, W. F.
4641L4 Fld: 22B STAR0611
1 Apr 68 31p
Rept No: NASA-CR-93921, JPL-TR-32-1250
Contract: NAS7-100

Descriptors: *Mariner space probes, *Paints, *Performance tests, *Protective coatings, *Temperature control, Mars probes, Space flight, Structural design, Surface properties, Thermal degradation

N68-20989 CFSTI Prices: PC$6.00 MF$0.95

FABRICATION OF THE 23-FT COLLIMATING MIRROR FOR THE JPL 25-FT SPACE SIMULATOR

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Eddy, R. P., Heilig, M. R.
4592J3 Fld: 14B STAR0610
15 Dec 67 27p
Rept No: NASA-CR-93792, JPL-TR-32-1214
Contract: NAS7-100

Descriptors: *Fabrication, *Mirrors, *Space simulators, *Structural design, Aluminum coatings, Collimators, Optical properties, Solar simulators, Temperature control

N68-20261 CFSTI Prices: PC$6.00 MF$0.95

MARINER MARS ABSORPTIVITY STANDARD

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Lewis, D. W., Thostesen, T. O.
4495E2 Fld: 22B, 20M STAR0609
1 Mar 67 46p
Rept No: NASA-CR-93489, JPL-TR-32-734
Contract: NAS7-100

Descriptors: *Absorptance, *Flat surfaces, *Mariner 4 space probe, *Surface properties, *Temperature control, Aluminum, Paints, Space simulators, Temperature measurement

N68-18700 CFSTI Prices: PC$6.00 MF$0.95

EFFECTS OF COMBINED SPACE RADIATION ON SOME MATERIALS OF LOW SOLAR ABSORPTANCE

Lockheed Missiles and Space Co Palo Alto Calif Lockheed Palo Alto Research Lab (210118)
Bailin, L. J.
4425A4 Fld: 11B, 11C, 22A USGRDR6809
Apr 67 7p
Availability: Published in National SAMPE Symposium (11th), p125-31 Apr 1967.

Abstract: The refractory material ZrO2.SiO2 is discussed as a component of inorganic silicate binder systems which are stable optically and physically under a variety of ground-simulated space conditions. These systems are finding application as passive thermal control and heat rejection coatings on spacecraft surfaces. The environments discussed are combined ultraviolet-electron, ultraviolet-proton, as well as the corresponding, but separate ultraviolet, electron, and proton environments. Previously determined data on neutron-gamma exposures are also included. For ZrO2.SiO2 as a pigment, it is shown that impurity content and temperature of preparation bear strongly on the optical properties, and consequently on the ability to reflect solar radiation and reject heat. The use of very high purity starting materials is shown as a requirement to obtain low solar absorptance, alpha-s, (high solar reflectance), as well as optical stability under ultraviolet radiation. For high purity pigments, combined UV-p, UV-e exposures, little or no synergism of effects is noted; that is, no greater increases in alpha-s (no greater discoloration) resulted from the combined exposure than from the UV, p, and e exposures separately. Small changes resulted from the proton and electron exposures, and no direct correlation with purity was noted. For ZrO2.SiO2 incorporated into silicate binders, the relations of purity and preparation variables to stability are similar to those for the pigment alone. However, the already high stability of the pigments seems to be enhanced by the binder, and even higher stabilities are achieved. (Author)

Descriptors: (*Refractory materials, Space environmental conditions), (*Silicates, Radiation damage), Zirconium oxides, Silicon dioxide, Coatings, Pigments, Binders, Ultraviolet radiation, Proton bombardment, Electron bombardment, Impurities, Optical properties, Stability, Spacecraft, Temperature control

AD-666 364

STABILITY OF THERMAL CONTROL COATINGS EXPOSED TO COMBINED SPACE ENVIRONMENTS DRAFT REPORT, JUN. 1966 - AUG. 1967

Avco Corp., Tulsa, Okla. Electronics Div.
Holland, W. R.
4404E1 Fld: 20M STAR0607
Dec 67 111p
Rept No: NASA-CR-73160
Contract: NAS2-3646

Descriptors: *Reflectometers, *Space environment simulation, *Thermal stability, Heat shielding, Irradiation, Protective coatings, Protons, Thermal insulation, Thermal simulation, Ultraviolet radiation, Vacuum chambers

N68-16904 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS TRIANNUAL REPORT, MAR. 1 - JUL. 31, 1967

IIT Research Inst., Chicago, Ill. Technology Center.
Noble, G. , Rogers, F. O., Zerlaut, G. A.
4394A3 Fld: 11C STAR0607
22 Sep 67 77p
Rept No: NASA-CR-61502, IITRI-U6002-55
Contract: NAS8-5379

Descriptors: *Thermal stability, *Ultraviolet radiation, *Zinc coatings, Coating, Impurities, Radiation effects, Space environment simulation, Ultraviolet spectroscopy, Zinc oxides

N68-16124 CFSTI Prices: PC$6.00 MF$0.95

THERMAL DESIGN VERIFICATION TESTING OF THE ANCHORED INTERPLANETARY MONITORING PLATFORM '' D''

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Medlin, J. W. Jr
4115A3 Fld: 22B, 20M STAR0601
Nov 67 26p
Rept No: NASA-TN-D-4112
Coll- 26 P Refs

Descriptors: *Imp, *Protective coatings, *Solar simulation, *Spacecraft design, Lunar orbiter, Spacecraft models, Temperature control, Thermal protection, Thermal simulation

N68-10299 CFSTI Prices: PC$6.00 MF$0.95

VOYAGER CAPSULE PHASE B. VOLUME III - SURFACE LABORATORY SYSTEM. PART B3 - ALTERNATIVES, ANALYSES, SELECTION FINAL REPORT

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mcdonnell Aircraft Corp., St. Louis, Mo.
4071L4 Fld: 22B, 22A STAR0524
31 Aug 67 202p
Rept No: NASA-CR-89694, F694, VOL. III, PT. B3
Contract: NAS7-100, JPL-952000
Prepared for Jpl

Descriptors: *Landing module, *Mars surface, *Space capsule, *Systems design, *Voyager project, Alternative, Cable, Capsule, Control, Design, Instrument, Laboratory, Landing, Mars (planet), Mechanical, Module, Packaging, Pyrotechnics, Science, Space, Structural, Subsystem, Surface, System, Thermal

N67-40584 CFSTI Prices: PC$6.00 MF$0.95

VOYAGER CAPSULE, PRELIMINARY DESIGN, PHASE B. VOLUME III - SURFACE LABORATORY SYSTEM. SECTION I - SURFACE LABORATORY FINAL REPORT

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Martin Co., Denver, Colo.
4065J2 Fld: 22B STAR0524
31 Aug 67 567p
Rept No: NASA-CR-89724, FR-22-103, VOL. III, SECT. I
Contract: NAS7-100, JPL-952001
Prepared for Jpl

Descriptors: *Laboratory, *Planetary surface, *Space capsule, *Voyager project, Capsule, Command, Constraint, Control, Design, Equipment, Mars, Mission, Packaging, Planetary, Power, Preliminary, Requirement, Space, Structure, Subsystem, Support, Surface, Telemetry, Thermal

N67-40445 CFSTI Prices: PC$6.00 MF$0.95

EFFECT OF ENVIRONMENT ON THERMAL CONTROL COATINGS INTERIM REPORT

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Stanford Research Inst., Menlo Park, Calif.
Freund, T. , Morrison, S. R.
4063B1 Fld: 11C STAR0524
1 Sep 67 25p
Rept No: NASA-CR-89555, IR-1
Contract: NAS7-100, JPL-951522
Prepared for Jpl

Descriptors: *Additive, *Degradation, *Protective coating, *Surface chemistry, *Ultraviolet radiation, Control device, Damage, Electron, Hole, Iron, Material testing, Optical property, Optimum, Recombination, Resistance, Thermal insulation, Vacuum effect, Zinc oxide

N67-40089 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF THERMAL TESTING TECHNIQUES AT HIGH SOLAR INTENSITIES FINAL REPORT, 13 AUG. 1965 - 13 MAY 1967

Lockheed Missiles and Space Co., Palo Alto, Calif. Aerospace Sciences Lab.
Marshall, K. N., Rolling, R. E.
3915B2 Fld: 22B, 20M STAR0521
Jun 67 87p
Rept No: NASA-CR-73098
Contract: NAS2-3164
Monitor: 18

Descriptors: *Environmental testing, *Solar simulation, *Spacecraft performance, *Temperature control, *Thermal protection, Analysis, Arc, Carbon, Computer, Control, Design, Environment, Filament, Lamp, Mathematics, Method, Model, Performance, Program, Protection, Simulation, Solar, Spacecraft, Surface, Temperature, Test, Testing, Thermal, Tungsten, Xenon

N67-36489 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF PHASE-CHANGE COATINGS FOR USE AS VARIABLE THERMAL CONTROL SURFACES FINAL REPORT

General Electric Co., Philadelphia, Pa. Missile and Space Div.
Griffin, R. N., Linuer, B.
3914C1 Fld: 22B, 11C STAR0521
Sep 67 59p
Rept No: NASA-CR-66394
Contract: NAS1-5330
Monitor: 18

Descriptors: *Protective coating, *Spacecraft shielding, *Temperature control, *Thermal absorption, Absorption, Binder, Change, Coating, Control, Evaporation, Irradiation, Phase, Protection, Shieluing, Spacecraft, Stability, Surface, Temperature, Thermal, Vacuum, Variable

N67-36080 CFSTI Prices: PC$6.00 MF$0.95

HANDBOOK OF OPTICAL PROPERTIES FOR THERMAL CONTROL SURFACES, VOLUME III FINAL REPORT

Lockheed Missiles and Space Co., Sunnyvale, Calif.
Breuch, R.
386404 Fld: 20M, 11B, 22B STAR0520
25 Jun 67 81p
Rept No: NASA-CR-87484, LMSC-A847882, VOL. III
Contract: NAS8-20353
Monitor: 18

Descriptors: *Control surface, *Handbook, *Temperature control, *Thermal insulation, *Thermophysical property, Absorber, Coating, Control, Data, Design, Flat, High performance, Information, Insulation, Material, Optical, Property, Reflector, Solar, Spacecraft, Surface, Temperature, Thermal, Thermophysical

N67-34625 CFSTI Prices: PC$6.00 MF$0.95

A STUDY OF THE BLISTERING OF METAL SURFACES BY SOLAR SYSTEM IONS FINAL REPORT

Avco Corp., Tulsa, Okla. Oklahoma Univ. Research Inst., Norman. Electronics Div.
Milacek, L. H., Wolfe, J. R.
3683K4 Fld: 11F STAR0517
Jun 67 94p
Rept No: NASA-CR-85570, TR-G-230-F
Contract: NASW-1431
Monitor: 18
Prepared Jointly With Oklahoma Univ.

Descriptors: *Aluminum, *Damage, *Gold, *Proton irradiation, Annealing, Blister, Control, Electron, Hydrogen, Irradiation, Low energy, Microscopy, Optical, Pit, Proton, Space flight, Surface, Thermal

N67-30889 CFSTI Prices: PC$6.00 MF$0.95

MARINER MARS 1964 TEMPERATURE CONTROL HARDWARE DESIGN AND DEVELOPMENT

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Carroll, W. , Coyle, G. G., Von Delden, H.
3523K4 Fld: 22B STAR0514
1 Jun 67 30p
Rept No: NASA-CR-84293, JPL-TR-32-955
Contract: NAS7-100
Monitor: 18

Descriptors: *Heat shield, *Mariner iv space probe, *Surface finish, *Temperature control, Antenna, Coating, Configuration, Control, Design, Finish, Heat, Louver, Material, Paint, Shield, Simulator, Surface, Temperature, Thermal

N67-26581 CFSTI Prices: PC$6.00 MF$0.95

THERMAL CONTROL CONSIDERATIONS FOR A MANNED ORBITING SPACE STATION

National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
Taylor, J. T.
3523G1 Fld. 22A STAR0514
May 67 48p
Rept No: NASA-TN-D-3995
Contract: 981-10-10-05-72
Monitor: 18

Descriptors: *Heat flux, *Manned orbital space station (moss), *Space radiator, *Temperature control, *Thermal property, Activity, Analysis, Balance, Coating, Control, Electric, Equilibrium, Flux, Heat, Load, Passive, Power, Property, Radiator, Space, Temperature, Thermal

N67-26551 CFSTI Prices: PC$6.00 MF$0.95

RESEARCH ACHIEVEMENTS REVIEW, VOLUME II

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
3423E2 Fld: 22A, 20M STAR0512
1966 56p
Rept No: NASA-TM-X-53557
Monitor: 18

Descriptors: *Control surface, *Infrared instrument, *Pegasus satellite, *Thermophysics, *Ultraviolet radiation, Absorption, Coating, Conductivity, Control, Criterion, Emissivity, Environment, Infrared, Instrument, Material, Model, Optical, Radiation, Radiometer, Satellite, Space, Spectrometer, Surface, Thermal, Ultraviolet

N67-24641 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF THE FABRICATION AND PACKAGING TECHNIQUES FOR THE ECHO II SATELLITE

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Talentino, J. P.
3421D3 Fld: 22B STAR0512
Dec 66 169p
Rept No: NASA-TM-X-55764, X-724-66-568
Monitor: 18

Descriptors: *Echo ii satellite, *Packaging, *Satellite design, *Test method, Absorption, Adhesive, Aluminum, Coating, Control, Cutting, Design, Emissivity, Environment, Evacuation, Fabrication, Foil, Folding, Gore, Inflation, Lamination, Method, Mylar, Reinforcement, Satellite, Sealing, Shrinkage, Strength, Structural, Test, Thermal, Weight

N67-23915 CFSTI Prices: PC$6.00 MF$0.95

RADIOMETRY RESEARCH

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
3361F2 Fld: 14B, 22A STAR0511
Mar 67 327p
Rept No: NASA-TM-X-55735, X-713-67-73
Monitor: 18

Descriptors: *Plasma arc, *Protective coating, *Solar cell, *Solar simulation, *Spectral analysis, *Temperature control, Analysis, Arc, Calibration, Cell, Coating, Control, Distribution, Energy, Experiment, Flux, Measurement, Plasma, Protection, Shock, Simulation, Solar, Spacecraft, Spectral, Stability, Temperature, Testing, Vacuum, Vortex

N67-22141 CFSTI Prices: PC$6.00 MF$0.95

THE THERMAL ENVIRONMENT IN SPACE

European Space Research Organization, Paris (France).
Husain, L. A.
3261H3 Fld: 22A STAR0509
Dec 66 26p
Rept No: ESRO-TM-49
Monitor: 18
Presented At the Esro Summer School, Oxford, 28 Aug. 1964

Descriptors: *Heat sink, *Satellite design, *Thermal environment, Coating, Control, Design, Earth, Effect, Environment, Heat, Radiation, Reflection, Satellite, Sink, Solar, Space, Surface, Temperature, Thermal, Transfer

N67-20298 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS

IIT Research Inst., Chicago, Ill. Technology Center.
Rogers, F. D., Zerlaut, G. A.
3195C2 Fld: 11C STAR0508
30 Nov 66 89p
Rept No: NASA-CR-82091, IITRI-U6002-47
Contract: NAS8-5379
Monitor: 18

Descriptors: *Inorganic coating, *Silicone, *Space simulation, *Temperature control, *Titanate, Absorption, Coating, Control, Infrared, Inorganic, Methyl, Paint, Photolysis, Reflection, Simulation, Solar, Space, Temperature, Zinc

N67-18517 CFSTI Prices: PC$6.00 MF$0.95

LOW SOLAR ABSORPTANCE AND EMITTANCE SURFACES UTILIZING VACUUM DEPOSITED TECHNIQUES FINAL REPORT, 29 JUN. 1965 - 28 SEP. 1966

Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab
3142J3 Fld: 11C, 22B STAR0507
Oct 66 82p
Rept No: NASA-CR-73039, REPT.-4-06-66-13
Contract: NAS2-3063
Monitor: 18

Descriptors: *Optical measurement, *Protective coating, *Spacecraft structure, *Vapor deposition, Absorption, Aluminum alloy, Characteristics, Coating, Control, Deposition, Irradiation, Measurement, Optical, Protection, Quartz, Silica glass, Silver, Solar, Spacecraft, Structure, Surface, System, Thermal, Vapor

N67-17182 CFSTI Prices: PC$6.00 MF$0.95

EFFECTS OF VACUUM-ULTRAVIOLET ENVIRONMENT OF THE OPTICAL PROPERTIES OF BRIGHT ANODIZED ALUMINUM

Air Force Materials Lab Air Force Systems Command Wright-Patterson AFB Ohio (000000)

Rept. for 1 Jan 63-1 Aug 64
Weaver, James H.
1715B4 USGRDR6509
Jan 65 2p
Rept No: tr-64-355
Project: 7340
Task: 734007

Abstract: The rapid increase in space vehicle design reliability and lifetime requirements has created a serious problem in the selection of materials for passive temperature control. The major difficulty is the prediction of the degradation of the thermal radiation properties of these materials under the space environment. Bright anodized aluminum coatings are known to possess the desired optical properties for passive temperature control and are being considered for space vehicle application. The effects of the vacuum-ultraviolet environment on the optical properties of bright anodized aluminum have been determined. The optical properties of the bright anodized aluminum system are only slightly altered by ultraviolet radiation in air. However, the combined vacuum-ultraviolet radiation is the most detrimental to the reflectance of bright anodized coatings prepared by the sulfuric acid process. The color centers formed during exposure causes a gradual increase in absorption up to 120 hours exposure. This increase in solar absorption causes the alpha sub s/epsilon ration to increase to 0.42 after approximately 120 hours exposure, but after this change, very little further change is noted, unlike most organic and inorganic coatings. (Author)

Descriptors: (*SPACE ENVIRONMENTAL CONDITIONS, ALUMINUM), (*ALUMINUM, COATINGS), (*COATINGS, ALUMINUM), (*PROTECTIVE TREATMENTS, ALUMINUM), OPTICAL PROPERTIES, TEMPERATURE CONTROL , ENVIRONMENTAL TESTS, ULTRAVIOLET RADIATION, LOW PRESSURE RESEARCH, DEGRADATION, THERMAL RADIATION, VACUUM, COLOR CENTERS, ABSORPTION, ALUMINUM COMPOUNDS, OXIDES

Identifiers: ANODIC COATINGS

AD-612 774 CFSTI Price: PC$3.00

PASSIVE THERMAL CONTROL COATINGS

Lockheed Missiles and Space C Palo Alto Calif (000000)
Gilligan, J. E., Sibert, M. E., Greening, T. A.
1281F3 USGRDR
1943 2p
Rept No: 5 10 63 9
Contract: AF04 647 787 , AF04 695 136
Rept. presented at Seventh Meeting of the Refractory Composites Working Group, Palo Alto, California, March 12-14, 1963.

Abstract: Development of a unique class of coating material systems for passive temperature control surfaces is described. Certain alkali silicate-based all-inorganic coating systems offer considerable promise for current longterm applications in this area of space technology. The major objective of this program is the development of coating systems with stable alpha/epsilon values of less than 0.30 after 2,000 to 6,000 sun-hour exposures under space environmental conditions, with lesser emphasis in systems with alpha/epsilon values of up to 1.20. (Author)

Descriptors: (*SPACECRAFT, THERMAL INSULATION), (*COATINGS, SPACECRAFT), (*THERMAL INSULATION, OPTICAL COATINGS), HEAT SHIELDS, SURFACES, SOLAR RADIATION, THERMAL RADIATION, CERAMIC COATINGS, FOILS, PAINTS, SPACE ENVIRONMENTAL CONDITIONS, SILICON COMPOUNDS, OXIDES, REFLECTION, AERODYNAMIC HEATING, STABILITY, ALKALI METALS, PHYSICAL PROPERTIES, ENVIRONMENT TESTS, REFLECTORS, SATELLITES (ARTIFICIAL), ORGANIC COATINGS, FLAME SPRAYING, SURFACE PROPERTIES, OPTICAL PROPERTIES, ABSORPTION, COMPOSITE MATERIALS

Identifiers: PLASMA SPRAY COATING

AD-602 894 CFSTI Price: PC$3.00

COMPONENTS PACKAGING TECHNIQUES

TRW Space Technology Labs Los Angeles Calif (000000)

Semiannual rept. for 1 Jul-31 Dec 59
Beck, George R.
1173H1 USGRDR
31 Dec 59
Rept No: TR-59-0000-09958
Contract: AF04 647 309

Abstract: This report summarizes and evaluates the present status of studies on electronic components packaging techniques described in PROJECT PLAN 165-21. These studies were conducted in four specific areas: (1) design technique studies, (2) materials and processes investigations, (3) microminiaturization and mechanized production studies, and (4) environmental test and vibration studies. For the design technique studies, the test vehicle selected consists of advanced gyro and digital programming circuits which are being packaged using both conventional printed circuit and advanced techniques. In the materials and processes investigations, the limitations of foam encapsulation caused by thermal effects have been analyzed. Investigation was started of capacitance discharge techniques for welding electronic part leads into circuits. The state of the art of microminiaturization has been reviewed in a survey of work in progress at numerous organizations in the electronics industry. Sinusoidal vibration testing, commonly employed in military qualification tests, has been compared in the laboratory with random vibration; equivalence data resulting from these tests are reported. The low-pressure electrical discharge study has been completed. (Author)

Descriptors: (*PACKAGED CIRCUITS, GUIDED MISSILE COMPONENTS), (*MICROMINIATURIZATION (ELECTRONICS), PACKAGING), PRINTED CIRCUITS, MODULES (ELECTRONIC), PLASTIC COATINGS, GYROSCOPES, WELDING, AIRBORNE, DESIGN, RELIABILITY (ELECTRONICS), EXPANDED PLASTICS, PROTECTIVE TREATMENTS, COATINGS, MATERIALS, VAPOR PLATING, VACUUM APPARATUS, QUALITY CONTROL, ENVIRONMENTAL TESTS, VIBRATION, TEMPERATURE CONTROL, ELECTRIC DISCHARGES, AGING (MATERIALS), ENCAPULATION

Identifiers: PLAN PROJECT

AD-605 564 CFSTI Price: PC$3.00

DESIGN CRITERIA FOR SILICON SOLAR CELL POWER SUPPLIES

TRW Space Technology Labs Los Angeles Calif (000000)
Robison, P. C.
1155J4 USGRDR
27 Feb 59 2p
Rept No: stl/tn-59-0000-00234

Abstract: General principles of design are outlined for the use of silicon solar cells for power in space probes. Several electrical characteristics important to design are considered. Analysis of possible geometric configurations of solar cells is given along with a semi-empirical method. Mention is made of temperatures and temperature control. The results are used to indicate a design approach.

Descriptors: (*SOLAR CELLS, SILICON), (*SPACECRAFT, POWER SUPPLIES), (*POWER SUPPLIES, SOLAR CELLS), DESIGN, COATINGS, GEOMETRIC CONFIGURATIONS, ELECTRICAL PROPERTIES, TEMPERATURE, TEMPERATURE CONTROL, SOLAR RADIATION, GLASS, SOLAR PANELS, EMISSIVITY, ELECTRIC CURRENTS, ENERGY CONVERSION, MATHEMATICAL ANALYSIS, PERFORMANCE (ENGINEERING), SPACE PROBES

AD-605 957 CFSTI Price: PC$3.00

EVALUATION OF THERMAL CONTROL COATINGS IN THE SPACE ENVIRONMENT FINAL REPORT, FEB. 1965 - AUG. 1966

Avco Corp., Tulsa, Okla. Electronics Div.
Cooley, J. A.
1123L2 Fld. 20M STAR0505
Dec 66 64p
Rept No: NASA-CR-73028, TR-66-G103-F
Contract: NASW-1162

Descriptors: *Potassium silicate, *Protective coating, *Solar absorber, *Space environment, *Zinc oxide, Absorber, Aluminum, Coating, Control, Electromagnetic, Environment, Irradiation, Metal, Oxide, Potassium, Protection, Proton, Silicate, Simulation, Solar, Space, Spacecraft, Temperature, Testing, Thermal, Vacuum, Zinc

N67-14922 CFSTI Prices: PC$6.00 MF$0.95

AN ANALOG STUDY OF THE PASSIVE THERMAL BEHAVIOR OF AN ORBITING SPACE STATION

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Clark, L. G., Wilson, J. W.
1065C2 Fld: 22A STAR0423
Oct 66 38p
Rept No: NASA-TN-D-3654

Descriptors: *Analog computer, *Orbital space station, *Thermal environment, Control, Crew, Equation, Fourier analysis, Heat transfer, Linear, Module, Spacecraft, Study, Surface, Wall

N66-38414 CFSTI Prices: PC$6.00 MF$0.95

PROCEEDINGS OF CONFERENCE ON SPACECRAFT COATINGS DEVELOPMENT

National Aeronautics and Space Administration, Washington, D. C.
1063K4 Fld: 20M STAR0423
1964 194p
Rept No: NASA-TM-X-56167
Conf. Held At Nasa Headquarters, Washington, D. C., 6 May 1964

Descriptors: *Absorption, *Coating, *Conference, *Optical property, *Spacecraft design, *Temperature control, *Thermal emission, Effect, Environment, Gamma, Infrared, Instrumentation, Radiation, Space, Spectral, Stability, Temperature, Ultraviolet

N66-37814 CFSTI Prices: PC$6.00 MF$0.95

THERMOPHYSICS RESEARCH AT MSFC RESEARCH ACHIEVEMENTS REVIEW, SERIES NO. 2

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
1053L4 Fld: 20M STAR0422
1965 42p
Rept No: NASA-TM-X-53490

Descriptors: *Computer program, *Infrared radiation, *Space environment, *Temperature control, *Thermal environment, *Thermophysics, Coating, Computer, Control, Effect, Emissivity, Environment, Experiment, Flight, Infrared, Measurement, Program, Property, Radiation, Research, Solid, Space, Surface, Temperature, Thermal

N66-37048 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, JAN. 20 - JUN. 20, 1966

IIT Research Inst., Chicago, Ill. Technology Center.
Zerlaut, G. A.
1035H1 Fld: 11C STAR0420
11 Jul 66 41p
Rept No: NASA-CR-77438, IITRI-U6002-42
Contract: NAS8-5379, 933-50-01-0000

Descriptors: *Inorganic coating, *Paint, *Potassium silicate, *Silicone, *Thermal instability, *Zinc oxide, *Zirconium compound, Calcium, Coating, Compound, Control, Double, Inorganic, Magnesium, Methyl, Oxide, Pigment, Potassium, Reflection, Silicate, Simulation, Space, Stability, Testing, Thermal, Zinc, Zirconium

N66-35172 CFSTI Prices: PC$6.00 MF$0.95

RESEARCH ON A SELF-TEMPERATURE REGULATING SPACECRAFT SKIN SYSTEM PROGRESS REPORT, DEC. 1, 1965 - MAY 31, 1966

Oklahoma State Univ., Stillwater. School of Mechanical Engineering.
Wiebelt, J. A.
1031F1 Fld: 22B STAR0419
Jun 66 26p
Rept No: NASA-CR-77101
Grant: NSG-454

Descriptors: *Skin temperature, *Solar simulation, *Space environment, *Temperature control, *Thermostat, Bimetallic, Control, Environment, Fin, Radiation, Simulation, Skin, Solar, Space, Spacecraft, Surface, Temperature

N66-34070 CFSTI Prices: PC$6.00 MF$0.95

PROCEEDINGS OF CONFERENCE ON ACTIVE TEMPERATURE CONTROL

National Aeronautics and Space Administration, Washington, D. C.
Mook, C. P.
1014K2 Fld: 20M STAR0419
1964 92p
Rept No: NASA-TM-X-56165
Conf. Held At Nasa Headquarters, 9 Apr. 1964

Descriptors: *Conference, *Spacecraft environment, *Temperature control, *Thermal radiation, Capillary, Control, Convection, Electronic, Equipment, Forced, Heat, Louver, Lunar, Mariner program, Micrometeoroid, Pump, Radiation, Shield, Surface, System, Temperature, Thermal

N66-32946 CFSTI Prices: PC$6.00 MF$0.95

BIBLIOGRAPHIES ON AEROSPACE SCIENCE - A CONTINUING BIBLIOGRAPHY WITH INDEXES, FEBRUARY 1965 - APRIL 1966

National Aeronautics and Space Administration, Washington, D. C.
0972B2 Fld: 5B STAR0415
Jun 66 100p
Rept No: NASA-SP-7006/02/

Descriptors: *Abstract, *Aerospace technology, *Bibliography, *Space science, Aerodynamics, Aerospace, Analysis, Astronomy, Astrophysics, Biology, Body, Control, Cosmology, Effect, Exploration, Factor, Flight, Lunar, Medicine, Orbit, Physiology, Planetary, Psychology, Radiation, Science, Space, Surface, Technology, Trajectory

N66-28039 CFSTI Prices: PC$6.00 MF$0.95

EVALUATION OF THERMAL CONTROL COATINGS IN THE SPACE ENVIRONMENT INTERIM REPORT

Avco Corp., Tulsa, Okla.
Cooley, J. A.
0971D1 Fld: 20G STAR0415
1 Nov 65 18p
Rept No: NASA-CR-75505, TR-65-359-6/A/
Contract: NASW-1162

Descriptors: *Environment simulation, *Solar simulator, *Space environment, *Test facility, Calibration, Coating, Control, Environment, Equipment, Facility, Holder, Monitor, Sample, Scanning, Simulator, Solar, Space, Testing, Thermal, Ultrahigh, Ultraviolet, Vacuum, Van de graaff accelerator

N66-27962 CFSTI Prices: PC$3.00 MF$0.95

USE OF THERMAL RERADIATIVE EFFECTS IN SPACECRAFT ATTITUDE CONTROL

Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
Peterson, C. A.
0965D1 Fld: 20M STAR0415
May 66 60p
Rept No: NASA-CR-75450, CSR-T-66-3
Contract: NASR-249

Descriptors: *Attitude control, *Oscillation, *Spacecraft control, *Thermal radiation, *Vibration damping, Absorption, Attitude, Control, Damping, Delay, Emission, Lag, Nonconservative, Radiation, Spacecraft, Surface, Thermal, Time, Torque, Vibration

N66-27748 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, MAY 20 - SEP. 20, 1965

IIT Research Inst., Chicago, Ill. Technology Center.
Zerlaut, G. A.
0933C4 Fld: 11C STAR0412
9 Nov 65 51p
Rept No: NASA-CR-71868, IITRI-U6002-31
Contract: NAS8-5379

Descriptors: *Coating, *Space environment, *Temperature control, Absorption, Control, Emission, Environment, Heat, Infrared, Inorganic, Methyl, Photolysis, Pigment, Polymer, Radiation, Ratio, Silicone, Solar, Space, Stability, Temperature, Thermal, Ultraviolet

N66-23831 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, SEP. 20, 1965 - JAN. 20, 1966

IIT Research Inst., Chicago, Ill. Technology Center.
Rubin, G. A., Zerlaut, G. A.
0931I1 Fld: 11C STAR0412
21 Feb 66 57p
Rept No: NASA-CR-74469, IITRI-U6002-36
Contract: NAS8-5379

Descriptors: *Paint, *Photolysis, *Pigment, *Protective coating, *Temperature control, Aluminum, Calcium, Coating, Control, Inorganic, Magnesium, Methyl, Oxide, Polymer, Protection, Silicate, Silicone, Stability, Surface, Temperature, Thermal, Ultraviolet, Zinc, Zirconium

N66-23749 CFSTI Prices: PC$6.00 MF$0.95

EXPERIMENTAL INVESTIGATION OF TOTAL EMITTANCE AND SOLAR ABSORPTANCE OF SEVERAL COATINGS BETWEEN 300 DEG AND 575 DEG K

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Curtis, H. B., Diedrich, J. H.
0902K2 Fld: 20M STAR0410
Apr 66 41p
Rept No: NASA-TN-D-3381

Descriptors: *Absorption, *Coating, *Nuclear power plant, Alloy, Aluminum, Control, Electric, Nuclear, Plant, Power, Radiator, Solar, Space, Thermal, Vacuum

N66-21038 CFSTI Prices: PC$6.00 MF$0.95

EFFECTS OF CRYODEPOSITS ON SPACECRAFT THERMAL CONTROL SYSTEMS

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Mc Connell, D. G.
0872K1 Fld: 20M STAR0408
1966 17p
Rept No: NASA-TM-X-52181
Presented At Natl. Conf. on Space Maintenance and Extra Vehicular Activities, Orlando, Fla., 1-3 Mar. 1966, Sponsored By Af and Martin Co.

Descriptors: *Cryogenics, *Deposit, *Heat regulation, *Spacecraft design, Array, Carbon, Control, Design, Dioxide, Hydrogen, Peroxide, Property, Radiative, Shadow, Shield, Spacecraft, Surface, Thermal, Vapor, Water

N66-17576 CFSTI Prices: PC$3.00 MF$0.95

PREPARATION OF S-13 EXPERIMENTAL COATINGS FINAL REPORT, OCT. 29, 1963 - AUG. 31, 1965

IIT Research Inst., Chicago, Ill.
Zerlaut, G. A.
0872A1 Fld. 11C STAR0408
14 Dec 65 40p
Rept No: NASA-CR-70385, IITRI-U6018-1
Contract: NAS8-11967

Descriptors: *Elastomer, *Pegasus satellite, *Protective coating, *Silicone, *Thermal protection, Absorption, Coating, Control, Emission, Environment, Evaluation, Heat, Methyl, Paint, Polymer, Protection, Resistance, Satellite, Simulation, Solar, Space, Spacecraft, Thermal

N66-17343 CFSTI Prices: PC$6.00 MF$0.95

ION BOMBARDMENT AND ITS EFFECTS ON THE OPTICAL PROPERTIES OF METALS

National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
Anderson, D. L.
0862D4 Fld: 20M STAR0407
1963 23p
Rept No: NASA-TM-X-57174

Descriptors: *Ion bombardment, *Metal surface, *Optical property, *Sputtering, Alloy, Aluminum, Bombardment, Control, Copper, Emission, Environment, Ion, Metal, Optical, Property, Solar, Space, Spacecraft, Surface, Temperature, Titanium

N66-16594 CFSTI Prices: PC$6.00 MF$0.95

SPACECRAFT TEMPERATURE CONTROL BY THERMOSTATIC FINS PROGRESS REPORT, 1 JUN. - 30 NOV. 1965

Oklahoma State Univ., Stillwater. School of Mechanical Engineering.
Maples, D. , Wiebelt, J. A.
0855A4 Fld: 20M STAR0407
Dec 65 11p
Rept No: NASA-CR-69877
Grant: NSG-454

Descriptors: *Control surface, *Cooling fin, *Temperature control, Control, Cooling, Feasibility, Fin, Heat, Insulation, Model, Movement, Simulation, Space, Spacecraft, Surface, Temperature, Testing, Thermal

N66-16186 CFSTI Prices: PC$3.00 MF$0.95

STUDY OF A HIGH RESOLUTION FACSIMILE SYSTEM EXPERIMENT ON THE SURFACE OF THE PLANET MARS FINAL REPORT

Aeronutronic, Newport Beach, Calif. Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
0824L3 Fld: 22A STAR0404
25 Feb 65 427p
Rept No: NASA-CR-68626, U-3034
Contract: JPL-950996
Prepared for Jpl

Descriptors: *Facsimile transmission, *Mars (planet), *Planetary landing, Antenna, Camera, Capsule, Communication, Control, Design, Dynamics, Electronics, Facsimile, Hardness, High resolution, Impact, Landing, Planetary, Power, Source, Space, Sterilization, Technology, Telecommunication, Thermal, Transmission, Transmitter

N66-13574 CFSTI Prices: PC$6.00 MF$0.95

PHYSICS ON THE MOON, SELECTED TOPICS CONCERNING LUNAR EXPLORATION

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Bucher, G. C., Stern, H. E.
0805I4 Fld: 3B STAR0402
Nov 65 275p
Rept No: NASA-TN-D-2944

Descriptors: *Lunar atmosphere, *Lunar environment, *Lunar exploration, *Moon, Atmosphere, Characteristic, Conference, Control, Energy, Environment, Exploration, History, Landing, Life, Lunar, Mission, Physical, Radiation, Site, Support, Surface, Thermal

N66-11251 CFSTI Prices: PC$6.00 MF$0.95

A COMPARISON OF TWO EMITTANCE MEASUREMENT TECHNIQUES

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Heaney, J. B.
0803E2 Fld: 20M STAR0401
Sep 65 20p
Rept No: NASA-TM-X-55294, X-713-65-354

Descriptors: *Protective coating, *Temperature control, *Thermal emission, Cavity, Coating, Control, Emission, Heat, Hohlraum, Inspection, Material, Measurement, Portability, Protection, Satellite, Skin, Technique, Temperature, Thermal

N66-10687 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS (PAINTS WITH LOW SOLAR ABSORPTANCE) EMITTANCE RATIOS/ TRIANNUAL REPORT

IIT Research Inst., Chicago, Ill. Technology Center.
Kaye, B. H., Zerlaut, G. A.
0794A1 Fld: 11C STAR0324
23 Feb 65 36p
Rept No: NASA-CR-67559, IITRI-C6014-21
Contract: NAS8-5379

Descriptors: *Absorption, *Coating, *Emission, *Stability, *Temperature control, Control, Distribution, Experiment, Fluoride, Oxide, Paint, Particle, Pigment, Ratio, Silicone, Size, Solar, Space, Spectrum, Temperature, Test, Titanium, Ultraviolet, Zinc

N65-36558 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS (PAINTS WITH LOW SOLAR ABSORPTANCE) EMITTANCE RATIOS/ TRIANNUAL REPORT, 20 JUN. - 20 OCT. 1964

IIT Research Inst., Chicago, Ill.
Gilligan, J. E., Harada, Y. , Zerlaut, G. A.
0782H4 Fld: 11C STAR0323
21 Dec 64 72p
Rept No: NASA-CR-67295, IITRI-C6014-18
Contract: NAS8-5379

Descriptors: *Protective coating, *Thermal protection, Absorption, Coating, Control, Paint, Protection, Resistance, Solar, Space, Stability, Thermal, Titanium, Zinc

N65-35122 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF SPACE-SYAPLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, JAN. 20 - MAY 20, 1965

IIT Research Inst., Chicago, Ill. Technology Center.
Firestone, R. F., Jamison, W. E., Zerlaut, G. A.
0782F3 Fld: 11C STAR0323
Jul 65 59p
Rept No: NASA-CR-67250, IITRI-C6014-26
Contract: NAS5-5379

Descriptors: *Infrared radiation, *Protective coating, *Solar absorber, Absorber, Absorption, Coating, Control, Development, Emission, Emitter, Infrared, Protection, Radiation, Solar, Stability, Thermal

N65-35112 CFSTI Prices: PC$6.00 MF$0.95

STABLE WHITE COATINGS INTERIM TECHNICAL PROGRESS REPORT, JUL. 3, 1964 - MAR. 2, 1965

IIT Research Inst., Chicago, Ill. Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Gilligan, J. E., Harada, Y. , Zerlaut, G. A.
0773A2 Fld: 11B STAR0322
30 Jun 65 120p
Rept No: NASA-CR-64948, IITRI-C6027-16
Contract: NAS7-100, JPL-950746
Prepared for Jpl

Descriptors: *Coating, *Potassium silicate, *Silicone, *Zinc oxide, Application, Control, Methyl, Oxide, Paint, Potassium, Silicate, Space, Stability, Thermal, White, Zinc

N65-33883 CFSTI Prices: PC$6.00 MF$0.95

STUDY OF MICROMETEOROID DAMAGE TO THERMAL CONTROL MATERIALS FINAL TECHNICAL REPORT, 7 FEB. - 3 NOV. 1964

Space Technology Labs., Inc., Redondo Beach, Calif. Physical Electronics Lab.
Friichtenicht, J. F.
0705F4 STAR0313
4 Feb 65 60p
Rept No: NASA-CR-62810, STL-4146-6009-SU-000
Contract: NAS8-11149

Descriptors: *Environment simulation, *Micrometeoroid, *Space environment, *Temperature control, Bombardment, Coating, Control, Damage, Environment, Metal, Property, Protection, Radiation, Simulation, Space, Surface, Thermodynamics

N65-24293 CFSTI Prices: PC$6.00 MF$0.95

INTEGRAL GLASS COATINGS FOR SOLAR CELLS FINAL REPORT, 4 MAY - 4 NOV. 1964

Hoffman Electronics Corp., El Monte, Calif. Semiconductor Div.
Iles, P. A.
0683D1 STAR0311
1964 91p
Rept No: NASA-CR-57963
Contract: NAS5-3857

Descriptors: *Glass coating, *Protective coating, *Solar cell, Cell, Coating, Control, Environment, Glass, Integral, Layer, Micrometeorite, Protection, Radiation, Solar, Space, Thermal, Thickness

N65-21322 CFSTI Prices: PC$6.00 MF$0.95

ADSORPTION OF HYDROGEN BY A THIN FILM OF TITANIUM

ARO, Inc., Arnold Air Force Station, Tenn.
Kindall, S. M.,
0345F2 Fld: 7D USGRDR6606
Aug 65 50p
Contract: AF40(600)-1200
Project: AF-8951, ARO-SW3417,
Task: 895104
Monitor: AEDC-TR-65-113

Abstract: Past experience has shown that the capture coefficient of a titanium surface for hydrogen is strongly dependent upon the surface temperature and the conditions under which the film is formed. This report presents the results of an investigation which determined the importance of some of the variables. It was found that the capture coefficient increased as the titanium surface temperature was decreased from 273 to 77K. Moreover, the capture coefficient could be further increased by lowering the temperature of the substrate upon which the titanium film was deposited from 273 to 77K. Also, the capture coefficient was found to be independent of film thickness and chamber pressure but increased when the deposition was carried out in an inert helium atmosphere. For the range of conditions investigated, the sticking fraction was found to vary from 0.01 to 0.5. The experimental data suggest that surface diffusion is an important part of the mechanism by which titanium captures hydrogen. Calculations using a theoretical model which incorporates diffusion agreed well with the experimental results. (Author)

Descriptors: (*Metal films, Titanium), (*Titanium, Adsorption), (*Hydrogen, Adsorption), (*Adsorption, Hydrogen), Surfaces, Surface properties, Vapor plating, Controlled atmospheres, Helium, Low-temperature research, Diffusion, Mathematical models, Vacuum apparatus, Space environmental conditions, Simulation

AD-468 316 CFSTI Prices: PC$6.00 MF$0.50

INVESTIGATION OF BONDING IN OXIDE-FIBER (WHISKER) REINFORCED METALS

General Electric Co., Philadelphia, Pa. Missile and Space Div. (149 070)

Quarterly technical rept. no. 2, 1 Oct-31 Dec 62
Sutton, Willard H.,
0241H1 Fld: 13H, 11F, 11D USGRDR4018
Jan 63 18p
Contract: DA36 034ORD3768
Project: 59332008
Monitor: AMRA-CR-63-01/2

Available copy will not permit fully legible reproduction.

Abstract: The reinforcement of metals by ultra high strength single crystal fibers offers a new means to greatly improve their strength over wide temperature ranges. One of the major problems to be solved is the attainment of high strength interfacial bonds between the whiskers and metal matrix. The purpose of this program, therefore, is to investigate the factors affecting the interfacial bonding which will lead ultimately to the development of high strength composites. This report discusses some preliminary studies on interactions between Ni and alpha Al2O3 at elevated temperatures. A sessile drop apparatus was completed and is currently being calibrated for studies on wetting (contact angle) and interfacial energies. The effects of various constituents added to pure Ni and of various coatings on alpha - Al2O3 on both the wetting anu bond strength will be evaluated.

Descriptors: (*Composite materials, Bonding), (*Single crystals, Reinforcing materials), (*Fiber metallurgy, Composite materials), Fibers, Oxides, Aluminum compounds, Nickel, High-temperature research, Coatings, Test methods, Test equipment, Controlled atmospheres, Surface properties

Identifiers: Whiskers(Single crystals)

AD-406 833 CFSTI Price: PC$1.00

THERMAL SWITCH

Patent assigned to NASA
Bozajian, John M.
0181B1 Fld: 13, 12 USGRDR4012
13 Apr 65
Monitor: 18
Available from Commissioner of Patents, Washington, D.C., 20231, $0.25

Abstract: The thermal switch is suited to the thermal control of spacecraft components to maintain constant temperature conditions irrespective of cyclic solar radiation environments. A pair of thermal contacts are provided in heat exchange relation with a pair of high conductivity surfaces thermally insulated from each other. A bi-metallic member is used to mount one of the contacts for movement into and out of engagement with the other contact in response to temperature variation of the first surface above and below a predetermined temperature.

Descriptors: (*Temperature control, Spacecraft), (*Heat exchangers, Temperature control), (*Temperature sensitive elements, Spacecraft), Patents, Heat transfer, Thermal conductivity, Surfaces, Temperature sensitive elements, Space environmental conditions

Patent 3,177,933

DETERMINATION OF THE EFFECTS OF PROCESSING REFRACTORY METALS UNDER VACUUM

Universal-Cyclops Steel Corp., Bridgeville, Pa.

Final rept. for 1 Apr 61-31 Mar 62
Cortes, F. R.,
007514 Fld: 26, 17 USGRDR3920
Feb 63 182p
Contract: AF33 616 8212
Project: 7381
Task: 738103
Monitor: ASD TDR62 618
A portion of the original document contains fine detail which may make reading of photocopy difficult.

Abstract: Ten representative refractory metal alloys were chosen for vacuum rolling studies. The degree and/or the effect of contamination incurred on 90Ta-10W, F-48, D-31, TZM, and Mo+0.5%Ti sheet hot rolled at 0.5 microns and at 100 microns pressure was evaluated over a range of rolling parameters. Data is presented showing qualitative differences in fabricability with pressure of each of these alloys. Mechanical property and metallographic data provide a quantitative indication of vacuum purity levels required to prevent surface contamination or minimize its effect in various alloys. Two alloys - D-41 and W+.6CB could not be successfully processed to starting size sheet for vacuum rolling studies due to the lack of sufficiently developed sheet processing procedures. In addition, technical difficulties prevented the vacuum rolling and evaluation of three tungsten base materials chosen for evaluation. (Author)

Descriptors: (*Refractory metal alloys, Rolling(Metallurgy)), (*Rolling(Metallurgy), Refractory metal alloys), (*Vacuum apparatus, Rolling(Metallurgy)), Molybdenum alloys, Titanium alloys, Zirconium alloys, Niobium alloys, Tantalum alloys, Tungsten alloys, Casting alloys, Powder alloys, Sheets, Rolling mills, Controlled atmospheres, Mechanical properties, Surface properties, Microstructure, Hardness, Tensile properties, Ductility, Impurities, Temperature, Pressure, Deformation, Vacuum, Impurities

Identifiers: Molybdenum alloy TZM, Molybdenum alloy 0

AD-401 487 OTS Price: HC $5.00

User1277   Date:15aug77   Time: 7:46:43   File: 6

Set	Items	Description
1	36835	TEMPERATURE?
2	20409	THERMAL
3	43427	RADIAT?
4	23255	HEAT
5	101441	1-4/OR
6	26363	SURFACE?
7	6942	COATING?
8	936	PAINT?
9	32662	6-8/OR
10	52391	CONTROL?
11	731	5*9*10
12	48992	SPACE
13	4290	VACUUM
14	52353	12+13
15	264	11*14
16	17881	VEHICLE?
17	33	15*16
18	231	15-17
19	4531	CONTAMINA?
20	2733	DEGRAD?
21	752	SPUTTER?
22	7931	19-21/OR
23	1257	9*22
24	200	14*23
25	177	24-15
26	7	16*25
27	0	SOLAR(W)HEAT(W)LOADING
28	0	ROMAGNETIC(W)CHARGING
29	0	ELECTROMAGNETIC(W)CHARGING
30	0	MAGNETOSPHERIC(W)DISTURBANCE

Print 26/5/1-7

Search Time: 0.081   Prints: 7   Descs.: 7

Orbiting Vehicle Nonmetallic Materials Combustion and Atmospheric Contaminant Control Standard for the MOL Orbiting Laboratory Program

Aerospace Corp El Segundo Calif El Segundo Technical Operations (400 156)

Technical operation rept.
D0192E1 Fld: 13L, 22B d7701
1 May 68 75p
Rept No: TOR-1001(2107-20)-1-a-rev-1
Contract: AF 04(695)-1001
Monitor: 18
Supersedes Rept. no. TOR-1001(2107-20)-1-A dated Feb 68.
Distribution limitation now removed.

Abstract: This specification delineates the conditions and requirements for use of nonmetallic materials in the MOL Orbiting Vehicles with respect to the flammability and toxicity hazards. The objective is to provide a high degree of safety. This specificiation does not include considerations for propellants and pyrotechnics. (Author, modified-PL)

Descriptors: (*Manned spacecraft, Fire safety), (*Space stations, Fire safety), (*Materials, Specifications), Space capsules, Organic materials, Flammability, Odors, Electric insulation, Embedding substances, Organic coatings, Toxicity, Air pollution, Thresholds(Physiology), Test equipment, Test methods, Fire safety

Identifiers: Flash point, Gemini, *Gemini b project, *Manned orbiting laboratories, *Mol(Manned orbiting laboratories), Outgassing, NTISDODXD

AD-856 742/2ST NTIS Prices: PC$4.50/MF$3.00

Interaction of exp 238 Puo sub 2 Heat Sources with Terrestrial and Aquatic Environments

Los Alamos Scientific Lab., N.Mex. (3820000)
Patterson, J. H., Nelson, G. B., Matlack, G. M., Waterbury, G. R.
C6142K4 Fld: 18N, 77C NSA3302
1975 28p
Rept No: CONF-751105-8, SM-199/100
Contract: W-7405-ENG-36
Monitor: 18

Abstract: Radioisotope thermoelectric generators used in space missions are designed with a great factor of safety to ensure that they will withstand reentry from orbit and impact with the earth, and safely contain the nuclear fuel until it is recovered. Existing designs, utilizing exp 238 PuO sub 2 fuel, have proved more than adequately safe. More data about the interaction of this material with terrestrial and aquatic environments is continually being sought to predict the behavior of these heat sources in the extremely unlikely contact of these materials with the land or ocean. Terrestrial environments are simulated with large environmental chambers that permit control of temperature, humidity, and rainfall using different kinds of soils. Rain falling on thermally hot chunks of exp 238 PuO sub 2 causes the spallation of the surface of the fuel into extremely fine particles, as small as 50 nm, that are later transported downward through the soil. Some of the plutonia particles become agglomerated with soil particles. Plutonium transport is more significant during winter than during summer because evaporation losses from the soil are less in winter. Aquatic environments are simulatec with large aquaria that provide temperature and aeration control. Earlier fuel designs that employed a plutonia-molybdenum cermet showed plutonium release rates of about 10 mu Ci/m exp 2 - s, referred to the total surface area of the cermet. Present advanced fuels, employing pure plutonium oxide, show release rates of about 20 nCi/m exp 2 - s in seawater and about 150 nCi/m exp 2 - s in freshwater. The temperature of these more advanced heat sources does nct seem to affect the release rate in seawater.

Descriptors: (*Plutonium 238, *Environmental effects), (*Soils, *Radionuclide migration), (*Aquatic ecosystems, Radionuclide migration), (*Radioisotope heat sources, *Safety), Contamination, Diffusion, Fresh water, Plutonium oxides, Power supplies, Rain water, Reentry, Seawater, Space vehicles, Surface waters, Thermoelectric generators

Identifiers: NTISERDA

LA-UR-75-2037 NTIS Prices: PC$4.00/MF$2.25

Plutonium-238 Release in Simulated Natural Environments

Los Alamos Scientific Lab., N.Mex. (3820000)
Patterson, J. H., Matlack, G. M., Nelson, G. B.
A6784D3 Fld: 8H, 68F NSA3102
1974 18p
Rept No: CONF-740921-9
Contract: W-7405-eng-36
Monitor: 18

Abstract: For abstract, see NSA 31 02, number 03324.

Descriptors: (*Space vehicles, Thermoelectric generators), (*Thermoelectric generators, *Radioisotope heat sources), (*Plutonium 238, *Diffusion), (*Soils, *Radionuclide migration), Contamination, Daily variations, Humidity, Impact tests, Plutonium oxides, Rain, Reentry, Surface air, Temperature dependence, Weather

Identifiers: NTISAEC

LA-UR-74-1590 NTIS Prices: PC$4.00/MF$2.25

Secom a New Concept for Communication Satellites with Electrical Propulsion for the Europa 2 Launcher

Messerschmitt-boelkow-blohm G.M.B.H., Munich (west Germany). Space Div.
Schweig, H.
A4161G4 Fld: 22B, 84G STAR1007
1971 21p
Rept No: MBB-UR-75-71-O
Conf- Presented At the 11th Dglr European Space Symp., Berlin, 24-26 May 1971

Descriptors: *Communication satellites, *Europa 2 launch vehicle, *Solar electric propulsion, *Transfer orbits, Conferences, Degradation, European space programs, Glass coatings, Ion engines, Solar arrays, Weight (mass)

N72-16483 NTIS Prices: PC$3.00/MF$0.95

EFFECTS OF WELD HEAT ON THE PROTECTIVE PROPERTIES OF CONVERSION COATINGS

National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Higgins, R. H.
5852J1 Fld: 11C STAR0707
3 Jan 69 28
Rept No: NASA-TM-X-53808
Conf- Presented Afml 50th Anniv., Corrosion of Mil. and Aerospace Equipment Symp., Denver, 22-25 May 1967, and Astra Conf. on Corrosion Probl. and Control, Kansas City, Mo., 13-14 Sep. 1967

Descriptors: *Chromates, *Corrosion resistance, *Protective coatings, *Thermal degradation, Aluminum alloys, Metal surfaces, Propellant tanks, Saturn 5 launch vehicles, Surface finishing, Temperature effects, Welding

N69-17467 CFSTI Prices: PC$6.00 MF$0.95

THE EFFECT OF SURFACE CONTAMINATION ON CONTACT ANGLES AND SURFACE POTENTIALS SUMMARY REPORT

Harris Research Labs., Inc., Washington, D. C.
Ellison, A. H., Schwartz, A. M.
0911B2 Fld: 13H STAR0411
13 Jan 66 46p
Rept No: NASA-CR-54708
Contract: NAS3-7104

Descriptors: *Fuel tank, *Liquid propellant, *Spacecraft, *Surface property, Behavior, Contamination, Effect, Fuel, Gravity, Liquid, Mercury, Propellant, Property, Sloshing, Space, Surface, Tank, Vehicle, Zero

N66-21728 CFSTI Prices: PC$6.00 MF$0.95

ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS SECOND QUARTERLY PROGRESS REPORT, JUL. 1 - SEP. 30, 1965

Public Health Service, Washington, D. C. Div. of Environmental Engineering and Food Protection.
Angelotti, R. , Campbell, J. E., Crawford, R. G., Gilchrist, J. E., Hall, H. E.
0843J2 Fld: 6F STAR0406
Oct 65 23p
Rept No: NASA-CR-69345
Contract: NASA ORDER R-36

Descriptors: *Bacillus, *Bacteria, *Contamination, *Toxicity, Acetone, Agar, Balsa, Component, Ecology, Filter, Interplanetary, Microorganism, Pad, Plastic, Plate, Recovery, Solubility, Space vehicle, Spore, Surface, Thermal, Wood

N66-15381 CFSTI Prices: PC$6.00 MF$0.95

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User1277   Date:15aug77   Time: 8:09:53   File:12

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  7  9067 VACUUM
  8 27669 6+7
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 10  1511 VEHICLE?
 11     0 HUTTLE
 12  1511 10+11
 13   127 SHUTTLE?
 14  1561 12+13
 15     5 5*14
 16  1168 2*3
 17     2 14*16

Print 15/5/1-5
Print 17/5/1-2

Search Time:  0.188   Prints:   7   Descs.:  15
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590211 A7407265
HAFNIA-A REFRACTORY THERMAL CONTROL COATING
BUCKLEY, J.D.; TANZILLI, R.A.
NASA, HAMPTON, VA., USA
AMERICAN CERAMIC SOC
AM. CERAM. SOC. BULL. (USA) VOL.52, NO.8 642 AUG. 1973
Coden: ACSBA7
AMERICAN CERAMIC SOCIETY STRUCTURAL CLAY PRODUCTS DIVISION MEETING (ABSTRACTS ONLY) 23-26 SEPT. 1973 PITTSBURGH, PA., USA
PRELIMINARY EVALUATION OF THE OPTICAL PROPERTIES OF HAFNIA COUPLED WITH HAFNIA'S GOOD THERMAL INSULATION PROPERTIES SUGGEST THE FEASIBILITY OF ITS USE AS A PROTECTIVE COATING ON SPACE VEHICLES. TESTS HAVE BEEN CONDUCTED IN A SOLAR SIMULATOR TO DETERMINE THE EFFECT OF SOLAR RADIATION ON THE OPTICAL PROPERTIES OF HAFNIA. THEORETICAL ANALYSES INDICATE THAT A HAFNIA COATING WOULD PROVIDE GOOD THERMAL RADIATIVE PROTECTION IN SPACE AND DURING RE-ENTRY INTO THE EARTH'S ATMOSPHERE
Descriptors: THERMAL INSULATING MATERIALS; HAFNIUM COMPOUNDS ; REFRACTORIES; PROTECTIVE COATINGS; OPTICAL PROPERTIES OF SUBSTANCES
Identifiers: HAFNIA; REFRACTORY THERMAL CONTROL COATING; OPTICAL PROPERTIES; THERMAL INSULATION PROPERTIES; PROTECTIVE COATING; SPACE VEHICLES; SOLAR SIMULATOR; EFFECT OF SOLAR RADIATION; HFO/SUB 2/
06
Section Class Codes: A9130
Unified Class Codes: ZGGAAR

326966 A7180942
THERMAL TESTING OF INFLATABLE SOLAR SHIELDS FOR CRYOGENIC SPACE VEHICLES
DOUGHTY, R.O.; JONES, L.R.
GENERAL DYNAMICS CORP., FORT WORTH, TEX., USA
LUCAS, J.W.;
AMERICAN INST. AERONAUTICS AND ASTRONAUTICS
SBN 0 262 12042 9
HEAT TRANSFER AND SPACECRAFT THERMAL CONTROL 580-600 1971
29 JUN-1 JUL 1971 LOS ANGELES, CALIF., USA
M.I.T. CAMBRIDGE, MASS., USA
THE EFFECTIVENESS OF AN INFLATABLE SPHERICAL SHIELD FOR PROTECTION OF CRYOGENIC PROPELLANTS FROM DIRECT SOLAR RADIATION WAS DETERMINED EXPERIMENTALLY. A HIGH-EMITTANCE (EPSILON=0.90) BAND OVER ONE-HALF OF THE BACKSIDE AREA OF THE SHIELD REDUCED BACKSIDE SHIELD TEMPERATURES OVER 20PERCENT . SOLAR MISALIGNMENT OF THE SHIELD HAD LITTLE EFFECT ON PROPELLANT TANK TEMPERATURES. FOR A STAGED, SUPERINSULATED MARS VEHICLE, THE LOW BACKSIDE SHIELD TEMPERATURES (-175 TO -200 DEGREESF) COULD REDUCE THE INITIAL MASS PLACED INTO EARTH ORBIT BY AS MUCH AS 40000 LBM ON CANDIDATE THERMAL-CONTROL COATINGS FROM EXTENDED EXPOSURE TO SOLAR- WIND PROTONS AND ULTRAVIOLET RADIATION WERE INVESTIGATED. TESTS WITH /SUP 1///SUB 4/-SCALE SPHERICAL SHIELDS UNDER SIMULATED SPACE CONDITIONS VERIFIED THE FEASIBILITY OF THE INFLATABLE SOLAR-SHIELD CONCEPT
Descriptors: SPACE RESEARCH; SPACE VEHICLES; RADIATION HEAT
Identifiers: EMITTANCE; THERMAL CONTROL COATINGS; INFLATABLE ; SOLAR SHIELDS; CRYOGENIC SPACE VEHICLES; SOLAR RADIATION
06
Section Class Codes: A2050, A0400

324255 A7177903
THE STATUS OF THERMOPHYSICS AS A MULTIDISCIPLINE AREA IN ASTRONAUTICS AND AERONAUTICS
HELLER, G.B.
NASA, HUNTSVILLE, ALA., USA
LUCAS, J.W.;
AMERICAN INST. AERONAUTICS AND ASTRONAUTICS
SBN 0 262 12042 9
HEAT TRANSFER AND SPACECRAFT THERMAL CONTROL 3-25 1971
29 JUN-1 JUL 1971 LOS ANGELES, CALIF., USA
M.I.T. CAMBRIDGE, MASS., USA
A SURVEY AND CRITICAL REVIEW OF THE FIELD OF THERMOPHYSICS ARE PRESENTED. PROBLEMS ARE HIGHLIGHTED IN THE AREAS OF TECHNOLOGY AND APPLICATIONS TO SPACE VEHICLES AND TO HYPERVELOCITY VEHICLES SUCH AS THE SPACE SHUTTLE. SPECIFIC ATTENTION IS GIVEN TO SPACECRAFT THERMAL DESIGN, ACTIVE AND SEMIACTIVE, THERMAL CONTROL, OPTICAL AND RADIATIVE PROPERTIES OF THERMAL CONTROL COATINGS, THE ELECTROMAGNETIC RADIATION ENVIRONMENT, EFFECTS OF THE SPACE ENVIRONMENT ON THERMAL CONTROL SURFACES, THERMAL PROBLEMS OF HYPERVELOCITY VEHICLES, CONTAMINATION OF THERMAL CONTROL SURFACES AND OF SPACE OPTICS, THE OPTICAL AND RADIATION PROPERTIES OF NATURAL PLANETARY SURFACES, AND REMOTE SENSING. IN A NUMBER OF AREAS PROBLEMS STILL OUTSTANDING ARE POINTED OUT (27 Refs)
Descriptors: HEAT; SPACE RESEARCH; REVIEWS
Identifiers: ASTRONAUTICS; AERONAUTICS; THERMOPHYSICS; SPACE VEHICLES; HYPERVELOCITY VEHICLES; THERMAL DESIGN; THERMAL CONTROL; OPTICAL; RADIATIVE PROPERTIES; COATINGS; REMOTE SENSING
06
Section Class Codes: A0400, A2050

233798 A7119758
THERMAL CONTROL COATINGS - AN ANALYTICAL TREATMENT
TURNER, M.A.; BOEBEL, C.P.
Report No.: AFML-TR-70-8; Issued by: AIR FORCE MATERIALS LAB., WRIGHT-PATTERSON AFB, OHIO, USA;
USGRDR No.: AD-706128
MARCH 1970
THE NEED FOR VARIOUS TYPES OF THERMAL CONTROL COATINGS HAS BEEN DERIVED AND SUMMARIZED FROM AN ANALYSIS OF SELECTED THERMAL PROBLEMS ENCOUNTERED IN SPACECRAFT HARDWARE COUPLED WITH AN ANALYSIS OF VARIANCE IN THE PARAMETERS OF THE THERMAL BALANCE. THIS OVERALL ANALYSIS INDICATES THE NEED FOR A COMPLETE SERIES OF STABLE COATINGS EACH HAVING A MINIMUM (0.1 OR LOWER) SOLAR ABSORPTANCE BUT WITH DIFFERENT OR CONTROLLABLE VALUES OF INFRARED EMITTANCE RANGING FROM 0.3 TO 1.0 IN ORDER TO COVER THE ENTIRE RANGE OF DESIRABLE SOLAR ABSORPTANCE/EMITTANCE RATIOS FROM 0.1 TO 0.3. THIS ANALYSIS WAS APPLIED ONLY TO A GENERALIZED EARTH ORBITING SPACECRAFT. WHERE INTERNAL HEAT DISSIPATION RATES EXCEEDED SEVERAL WATTS/SQ. FT., ACTIVE HEAT REMOVAL SYSTEMS WOULD BE REQUIRED
Descriptors: SPACE VEHICLES; TEMPERATURE; HEAT TRANSFER
Identifiers: THERMAL CONTROL COATINGS; SPACE VEHICLES; HEAT DISSIPATION
11
Section Class Codes: A2050, A0400
Availability: CFSTI, SPRINGFIELD, VA. 22151, USA

179339 A7062080
NEW DEVELOPMENTS IN REFRACTORY PIGMENTS FOR WHITE THERMAL CONTROL COATINGS
BAILIN, L.J.; SIBERT, M.E.
LOCKHEED PALO ALTO RES. LAB., CALIF., USA
AIR FORCE CAMBRIDGE RES. LABS., LOCKHEED MISSILES AND SPACE CO
PROCEEDINGS OF THE THERMODYNAMICS AND THERMOPHYSICS OF SPACE FLIGHT CONFERENCE 191-209 1970
23-25 MAR 1970 PALO ALTO, CALIF., USA
AFOSR ARLINGTON, VA., USA
THE DEVELOPMENT OF RADIATION STABLE REFRACTORY OXIDES IN WHITE THERMAL CONTROL COATINGS IS PRESENTED IN THE LIGHT OF NEW CONCEPTS OBTAINED FROM A CONSIDERATION OF THE INTERACTION OF THE SILICA-BEARING ZIRCONIA PIGMENT WITH AN AQUEOUS POTASSIUM SILICATE BINDER. SEVERAL POSTULATES ARE EXAMINED IN ORDER TO EXPLAIN THE SIGNIFICANT DIFFERENCES IN STABILITY OBSERVED BETWEEN PIGMENTS AND THE SILICATE COATINGS WHICH CONTAIN THESE PIGMENTS. A NEW CONCEPT, THAT OF PHOTOCATALYSIS AS APPLIED TO THE DEGRADATION OF THERMAL CONTROL MATERIALS, IS PRESENTED
Descriptors: SPACE VEHICLES; MATERIALS
06
Section Class Codes: A1665

896326 A7637470
MARTIAN SANDSTORMS AND THEIR EFFECTS ON THE 1975 VIKING LANDER SYSTEM
MAEGLEY, W.J.; DIEDERICH, D.P.
MARTIN MARIETTA CORP., DENVER, CO, USA
J. TEST. AND EVAL. (USA) VOL.3, NO.5 380-8 SEPT. 1975
Coden: JTEVAB
SYMPOSIUM ON STATE OF THE ART FOR PARTICULATE CONTAMINATION AND CONTROL 25 JUNE 1974 WASHINGTON, DC, USA
A MODEL OF A MARTIAN SANDSTORM HAS BEEN DERIVED FROM PRESENTLY AVAILABLE DATA. THE EROSIONAL EFFECTS OF SUCH A STORM ON THE VIKING LANDER WERE DETERMINED BY TEST, AND MODIFICATIONS INVOLVING THE APPLICATION OF SILICONE-BASED PROTECTIVE MATERIAL WERE MADE TO INSURE LANDER SURVIVABILITY OVER THE PLANNED 60-DAY MISSION. MATERIAL ERODED BY WINDBLOWN SAND IS EXPECTED TO PROVIDE A SOURCE CONTAMINANT FOR THE SOIL SAMPLES USED IN THE ORGANIC ANALYSIS EXPERIMENT. RESULTS OF ANALYSES PREDICTING THE LEVEL OF SUCH CONTAMINATION INDICATE THAT SOIL SAMPLE CONTAMINANT CONCENTRATION WILL BE BELOW THE ACCEPTABLE MAXIMUM (17 Refs)
Descriptors: ABRASION; STORMS; SAND; MARS; SPACE VEHICLES; SOIL
Identifiers: MARTIAN SANDSTORMS; 1975 VIKING LANDER SYSTEM; EROSIONAL EFFECTS; SOIL SAMPLE CONTAMINANT; SILICONE BASED PROTECTIVE COATING; PARTICULATE CONTAMINATION; MARS PROBES; SPACECRAFT; ABRASION
06
Section Class Codes: A9523, A9580
Unified Class Codes: ZMEEGW, ZMVARA

60935 A6940111
OPTICAL SURFACE DEGRADATION FROM COMBINED ULTRAVIOLET RADIATION AND OUTGASSED MATERIALS
SCANNAPIECO, J.F.; GRIFFIN, R.N.
G.E.C., MISSILE SPACE DIV., VALLEY FORGE, PA., USA
AMERICAN VACUUM SOCIETY
J. VACUUM SCI. TECHNOL. (USA) VOL.6, NO.1 209-13 JAN. 1969
25TH NATIONAL VACUUM SYMPOSIUM 30 OCT-1 NOV 1968 PITTSBURGH
AMONG PROBLEMS, WHICH HAVE BEEN ENCOUNTERED IN TESTING AND FLIGHT OF SPACECRAFT, HAVE BEEN THOSE RELATED TO THE OUTGASSING OF MATERIALS IN VACUUM. TWO OF THE MAJOR PROBLEMS CAUSED BY OUTGASSING ARE ELECTRICAL CORONA DISCHARGE, AND CONDENSATION ONTO CRITICAL SURFACES. THE SURFACES OF A SPACECRAFT MOST SUSCEPTIBLE TO DAMAGE BY CONDENSATION OF A FOREIGN MATERIAL ARE THOSE USED FOR THERMAL CONTROL AND THOSE USED IN OPTICAL SYSTEMS. THIS PAPER DESCRIBES THE TECHNIQUES USED TO DETERMINE THE EFFECTS OF OUTGASSED MATERIALS CONDENSED ON MGF/SUB 2/ OVERCOATED ALUMINUM MIRRORS WHILE THE MIRRORS WERE IRRADIATED WITH ULTRAVIOLET LIGHT IN VACUUM. MIRROR TEMPERATURES AS LOW AS -60 DEGREESC WERE USED TO DETERMINE THE POINT AT WHICH CONDENSATION WAS INCIPIENT. THE MEASUREMENTS PERFORMED ON THESE MIRRORS INCLUDED REFLECTANCE AT LYMAN ALPHA (1216 AA) AND INFRARED ANALYSIS OF THE DEPOSIT. THE INITIAL RESULTS OBTAINED WITH THIS SYSTEM DEMONSTRATE THAT LYMAN ALPHA REFLECTANCE IS ESSENTIALLY UNAFFECTED BY HEAVY CONDENSATES OF SOME MATERIALS BUT ALMOST COMPLETELY DESTROYED BY VERY THIN DEPOSITS OF OTHER MATERIALS
Descriptors: MG CPDS; PHYS. EFF. RAD.; MIRRORS; SPACE VEHICLES/INSTRUM.; CONDENSATION; AL
06
Section Class Codes: A2050

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User1277   Date:15aug77   Time: 8:15:24   File:34

Set Items Description
  1 51651 SERIAL# R3D
  2 21561 SERIAL# R3E
  3  5256 SERIAL# R3F
  4 28088 CONTROL?
  5    19 1*2*4
  6 10615 SPACE
  7  2175 VACUUM
  8 12752 6+7
  9     2 5*8

Print 9/5/1-2

Search Time:  0.092   Prints:   2   Descs.:  13
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Print 9/5/1-2
DIALOG File34: SCISEARCH 74-77/WK25 (COPR. I.S.I., Inc.) (Item 1 of 2) User1277 15aug77

1103792 MEETING AB OATS ORDER#: BN471 0 I. REFS
DEVELOPMENT OF AN UNUSUAL COATING SYSTEM FOR THERMAL CONTROL OF SPACE-SHUTTLE ORBITER (EN)
BEASLEY RM; GAROFALINI SH; WHEELER WH
LOCKHEED MISSILES & SPACE CO/SUNNYVALE//CA/
AMERICAN CERAMIC SOCIETY BULLETIN, V55, N4, P412-412, 1976

0764623 ARTICLE OATS ORDER#: AN465 5 REFS
EFFECT OF CONDUCTIVE THERMAL-CONTROL PAINT ON SPACECRAFT-ANTENNA PERFORMANCE (EN)
KEEN KM
EUROPEAN SPACE TECHNOL CTR/NOORDWIJK//NETHERLANDS/
ELECTRONICS LETTERS, V11, N17, P412-413, 1975

Set	Items	Description
1	21561	SERIAL# R3E
2	5256	SERIAL# R3F
3	180	1*2
4	10	SPACE(W)VEHICLE
5	6	SPACE(W)VEHICLES
6	16	4+5
7	0	3*6
8	10615	SPACE
9	2175	VACUUM
10	12752	8+9
11	5	3*10

Print 11/5/1-5

Search Time: 0.095 Prints: 5 Descs.: 12

1404445 (*offline*)

1374466 ARTICLE OATS ORDER#: CJ765 3 REFS
CONVERSION OF VACUUM COATING UNITS FOR SPUTTER COATING (EN)
ALLEN TD; SIMMENS SC
CHRISTIE HOSP & HOLT RADIUM INST,PATERSON LABS,EM UNIT/MANCHESTER M20 9BX/LANCASHIRE/ENGLAND/; SHIRLEY INST/MANCHESTER M20 8RX//ENGLAND/
MICRON, V7, N2, P141-144, 1976

0994236 ARTICLE OATS ORDER#: BA585 11 REFS
SURFACE CONTAMINATION OF ACTIVE ELECTRODES IN PLASMAS - DISTORTION OF CONVENTIONAL LANGMUIR PROBE MEASUREMENTS (EN)
SZUSZCZEWICZ EP; HOLMES JC
USN,RES LAB,EO HULBURT CTR SPACE RES/WASHINGTON//DC/20375
JOURNAL OF APPLIED PHYSICS, V46, N12, P5134-5139, 1975

0938046 ARTICLE OATS ORDER#: BC046 9 REFS
INACCURACIES IN ELECTRON-DENSITY ESTIMATES DUE TO SURFACE CONTAMINATION OF LANGMUIR PROBES (EN)
OYAMA KI; HIRAO K
UNIV TOKYO,INST SPACE & AERONAUT SCI/KOMABA 153/TOKYO/JAPAN/; UNIV TOKYO,INST SPACE & AERONAUT SCI/KOMABA 153/TOKYO/JAPAN/
PLANETARY AND SPACE SCIENCE, V24, N1, P87-89, 1976

0916353 ARTICLE OATS ORDER#: BA585 11 REFS
SURFACE CONTAMINATION OF ACTIVE ELECTRODES IN PLASMAS - DISTORTION OF CONVENTIONAL LANGMUIR PROBE MEASUREMENTS (EN)
SZUSZCZEWICZ EP; HOLMES JC
USN,RES LAB,EO HULBURT CTR SPACE RES/WASHINGTON//DC/20375
JOURNAL OF APPLIED PHYSICS, V46, N12, P5134-5139, 1975

User1277 Date:19sep77 Time:16:12:02 File: 6

Set	Items	Description
1	20539	THERMAL
2	49869	CONTROL
3	308	THERMAL(W)CONTROL
4	1429	(1*2)+3
5	49282	SPACE
6	19745	STATION
7	4726	5*6
8	260	SPACE(W)STATION
9	4726	7+8
10	23	4*9
11	369	RADIATOR?
12	1	9*11

Print 10/5/1-23

Search Time: 0.108 Prints: 23 Descs.: 9

Inclusion of Explicit Thermal Requirements in Optimum Structural Design

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Adelman, H. M.; Sawyer, P. L.

D2902H1 Fld: 1A, 1C, 51A, 51C STAR1512
Mar 77 41p
Rept No: NASA-TM-X-74017
Monitor: 18

Abstract: A finite-element based procedure is described for obtaining minimum mass designs of structures subjected to combined thermal and mechanical loading and both strength and thermal constraints. The procedure is based on a mathematical programming method using the Sequence of Unconstrained Minimizations Technique (SUMT) in which design requirements are incorporated by an exterior penalty function. The procedure is limited to steady-state temperatures which are controlled by structural sizing only. The optimization procedure is demonstrated by the design of a structural wing box with both mechanical loading and external heating, subject to design constraints on stress, minimum gage, and temperature. The final design for these conditions is compared with a corresponding design in which temperature constraints are omitted.

Descriptors: *Thermal stresses, *Wing loading, Optimal control, Structural design criteria, Finite element method, Mechanical properties, Stress concentration, Temperature effects

Identifiers: NTISNASA

N77-21469/0ST NTIS Prices: PC A03/MF A01

Particulate and Solar Radiation Stable Coating for Spacecraft

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

Patent.

AUTHOR: Slemp, W. S.

D2533B2 Fld: 22B, 11C, 84G, 71E, 90 STAR1509
Patented 15 Feb 77 4p
Rept No: PATENT-4 008 348, PAT-APPL-578 240
Monitor: 18
Misc-Filed 16 May 1975 Supersedes N75-29431 (13 - 20, p 2526). Subm-Continuation-in-Part of Abandoned US Patent Appl. Sn-428992, Filed 27 Dec. 1973.
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of Patent available Commissioner of Patents, Washington, D.C.

Abstract: A laminate thermal control coating for spacecraft comprising a layer of solar radiation stable film, a layer of particulate radiation stable film applied to the upper surface of the solar radiation stable film, and a layer of reflecting material applied to the lower surface of the solar radiation stable film was described. The coating experiences no increase in solar radiation absorptance (the proportion of radiant energy absorbed) upon exposure to particulate or solar radiation as the particulate radiation is substantially absorbed in the particulate radiation stable layer and the solar radiation partially absorbed by the particulate radiation stable layer is transmitted by the solar radiation stable film to the reflecting material which reflects it back through the laminate and into space.

Descriptors: *Solar radiation, *Spacecraft structures, *Thermal control coatings, *Patents, Film cooling, Heat shielding, Laminates, Radiation absorption

Identifiers: PAT-CL-428-35, NTISNASA

N77-18382/0ST NTIS Price: Not available NTIS

Space Linkage System. Analytical Study and Preliminary Design. Volume I

Lockheed Missiles and Space CO Sunnyvale Calif (210 120)

Final rept. 1 Mar 66-1 Apr 67
AUTHOR: Weiten, E. F.; Daughton, A. J.; Heim, J. R.; Woldow, A. F.; Dotson, R. D.
D1905G4 Fld: 10B, 9A d7710
Apr 67 115p
Rept No: LMSC-A858074-Vol-1
Contract: AF 33(615)-3709
Project: AF-3145
Task' 314502
Monitor: AFAPL-TR-67-53-Vol-1
See also Volume 2, AD-816 040.
Distribution limitation now removed.

Abstract: The objective of this study was to analytically determine the problems associated with a space linkage used to tether a sun-oriented space power system to an earth-oriented mission vehicle and to provide a preliminary design of a feasible space linkage system consistent with the established analytical results and criteria. A computer program was developed in which the appropriate parameter variations of control system design of the two vehicles were analyzed. Families of possible space linkages were established from which the final space linkage configuration evolved. This configuration utilizes either a Ryan type deployable boom or a folding type of linkage. Assuming a five-minute extension time for the space linkage, a loads and dynamics response analysis was accomplished which established the loads for the space linkage preliminary design. It is concluded that a linkage providing four degrees of freedom at appropriate locations will meet the mission requirements of this study. One of these degrees of freedom must be placed on the mission vehicle, providing 90 degrees of rotation to allow system operation at any orbital inclination angle. 10-KW power transfer and signal transfer is accomplished by using slip rings and flexible cables at appropriate degrees of freedom joints. A balance analysis was performed on the two connected space bodies and revealed that the system must be perfectly balanced for minimum attitude control torques. (Author)

Descriptors: (*Power supplies, Spaceborne), (*Transmission lines, *Rendezvous spacecraft), Electric cables, Electric connectors, Solar cells, Electric power production, Energy conversion, Design, Booms(Equipment), Configuration, Aerodynamic loading, Drag, Angle of attack, Deployment, Structural properties, Slip rings, Loads(Forces), Thermal analysis, Weight, Attitude control systems, Torque

Identifiers: Astec(Advanced solar turbo electric concept), Station keeping, NTISDODXD

AD-816 039/2ST NTIS Prices: PC A06/MF A01

Nasa Office of Aeronautics and Space Technology Summer Workshop. Executive Summary

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
D1825L2 Fld: 5A, 22A, 22B, 84A, 70E, 84C STAR1504
Aug 75 92p
Rept No: NASA-TM-X-73960
Grant: NSG-1186
Monitor: 18
Seri-11. Subm-Prepared Jointly with Old Dominion Univ., Norfolk, VA. Conf-Conducted at Madison College, Harrisonburg, VA., 3-16 Aug. 1975.

Abstract: Research and technology investigations are identified in eleven discipline technologies which require or which could significantly benefit from an in-space experiment, systems demonstrations, or component test using the Space Transportation System. Synopses of the eleven technology panels reports are presented.

Descriptors: *Aerospace environments, *Conferences, *Mission planning, *Research projects, *Space transportation, *Spacelab, Cryogenics, Data processing, Life support systems, Space manufacturing, Space shuttles, Thermal control coatings, User requirements

Identifiers: *Meetings, NTISNASA

N77-13921/OST NTIS Prices: PC A05/MF A01

Nasa Office of Aeronautics and Space Technology Summer Workshop. Volume 8: Thermal Control Panel

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

Final Report.
D1825K2 Fld: 22A, 22B, 5A, 84A, 84C, 70E STAR1504
Aug 75 170p
Rept No: NASA-TM-X-73968
Grant: NSG-1186
Monitor: 18
Seri-11. Subm-Prepared Jointly with Old Dominion Univ., Norfolk, VA. Conf-Conducted at Madison College, Harrisonburg, VA., 3-16 Aug. 1975.

Abstract: Technology deficiencies in the area of thermal control for future space missions are identified with emphasis on large space structures and cold controlled environments. Thermal control surfaces, heat pipes, and contamination are considered along with cryogenics, insulation, and design techniques. Major directions forecast for thermal control technology development and space experiments are: (1) extend the useful lifetime of cryogenic systems for space, (2) reduce temperature gradients, and (3) improve temperature stability.

Descriptors: *Conferences, *Mission planning, *Spacelab, *Technology assessment, *Temperature control, Cryogenics, Life (Durability), Space shuttles, Temperature gradients, Thermal control coatings, Thermal stability

Identifiers: *Meetings, NTISNASA

N77-13917/8ST NTIS Prices: PC A08/MF A01

Effects and Control of Contamination from a Scaled MOL Attitude Control Thruster in a Radial Orientation

Arnold Engineering Development Center Arnold Air Force Station Tenn (042 550)

Final rept. May-21 Dec 68
AUTHOR: Hill, David W. Jr; Smith, Dale K.
D0022C3 Fld: 21B, 22B d7626
Oct 69 80p
Rept No: AEDC-TR-69-175
Contract: F40600-69-C-0001
Project: ARO-SB0721
Monitor: 18
Prepared in cooperation with ARO, Inc., Tullahoma, Tenn.
Distribution limitation now removed.

Abstract: A test was conducted to determine the effects of contamination produced by a 1-lb scaled Manned Orbital Laboratory thruster. The test required pulsing the 1-lb attitude control thruster in its radial orientation and determining the effects of contaminates from the thruster impinging on optical and thermal control surface test specimens located on a flat plate exposed to the thruster exhaust plume The thruster was pulsed with durations of 20. 50, 100, and 1000 msec with 1000 msec off time at altitudes above 400,000 ft. Significant contamination was produced for the pulse-mode operation. Methods for control of contamination from the thruster and on the plate were investigated. In situ reflectance, emittance, and transmittance measurements were made on the optical and thermal control surface test specimens under vacuum conditions and at atmospheric pressure. Pretest and posttest laboratory measurements were made at atmospheric conditions. Contamination deposited on the plate was near and below the thruster exit. and the amount of contamination produced by the thruster decreased as the thruster pulse duration increased. Contamination controls evaluated during the test were the heated shroud and a fence located on the plate. (Author)

Descriptors: (*Manned spacecraft, Space stations), (*Attitude control systems, Thrust augmentation), (*Exhaust flames. Contamination), Space capsules, Rocket nozzles. Combustion. Combustion chambers. Heat flux. Thermal analysis

Identifiers: Manned orbiting laboratories. Mol(Manned orbiting laboratories). Rocket exhaust, NTISDODXD

AD-860 705/3ST NTIS Prices: PC$5.00/MF$3.00

Effect of a Surface-to-Gap Temperature Discontinuity on the Heat Transfer to Reusable Surface Insulation Tile Gaps

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Throckmorton, D. A.
C7422D2 Fld: 22B, 20M, 84C STAR1417
Jun 76 35p
Rept No: NASA-TN-D-8233, L-10766
Monitor: 18

Abstract: An experimental investigation is presented that was performed to determine the effect of a surface-to-gap wall temperature discontinuity on the heat transfer within space shuttle, reusable surface insulation, tile gaps submerged in a thick turbulent boundary layer Heat-transfer measurements were obtained on a flat-plate, single-gap model submerged in a turbulent tunnel wall boundary layer at a nominal free-stream Mach number of 10.3 and free-stream Reynolds numbers per meter of 1.5 million, 3.3 million and 7.8 million. Surface-to-gap wall temperature discontinuities of varying degree were created by heating the surface of the model upstream of the instrumented gap. The sweep angle of the gap was varied between 0 deg and 60 deg; gap width and depth were held constant. A surface-to-gap wall temperature discontinuity (surface temperature greater than gap wall temperature) results in increased heat transfer to the near-surface portion of the gap, as compared with the heat transfer under isothermal conditions, while decreasing the heat transfer to the deeper portions of the gap. The nondimensionalized heat transfer to the near-surface portion of the gap is shown to decrease with increasing Reynolds number; in the deeper portion of the gap, the heat transfer increases with Reynolds number. (Author)

Descriptors: *Reusable heat shielding, *Space shuttles, Gaps, Heat transfer, Temperature effects, Temperature gradients, Thermal insulation, Tiles, Aerodynamic heating, Flat plates, Heat measurement, Reynolds number, Thermal control coatings, Turbulent boundary layer, Wind tunnel models

Identifiers: NTISNASA

N76-26432/4ST NTIS Prices: PC$4.00/MF$3.00

Extreme Temperature Thermal Control Coating

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

Patent Application.
AUTHOR: Johnson, L. E.
C7421B2 Fld: 11C, 13A, 71E, 90 STAR1417
Filed 21 May 76 6p
Rept No: PAT-APPL-688 879, NASA-CASE-LAR-11756-1
Monitor: 18
Subm-Sponsored by NASA.
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Abstract. A thermal control coating is disclosed which may be applied to a flexible substrate. The coating remains pliant and resistant to abrasion over a wide temperature range.

Descriptors: *Protective coatings, *Thermal insulation, *Patent applications, Flexibility, Heat shielding, Temperature control

Identifiers: NTISNASA

N76-26284/9ST NTIS Prices: PC$3.50/MF$3.00

Lubricant Reservoir Systems: Thermal Considerations

Aerospace Corp El Segundo Calif Chemistry and Physics Lab*Space and Missile Systems Organization, Los Angeles Air Force Station, Calif. (409383)

Interim rept.
AUTHOR: Dormant, Leon M.; Feuerstein, Seymour
C5591G2 Fld: 13K, 20M, 99F, 72K GRAI7601
9 Oct 75 18p
Rept No: TR-0076(6270-30)-1
Contract: F04701-75-C-0076
Monitor: SAMSO-TR-75-239

Abstract: The thermal conditions necessary to ensure that porous nylon lubricant reservoirs properly function as lubricant replenishment sources are derived by thermodynamic methodology. The porous nylon must be warmer than its surroundings by at least an amount delta T, which may be expressed by the relation delta T=-2 gamma V T sub B rH where T sub B is the system temperature, r is the nylon pore radius, and gamma, V, and H are the surface tension, the molar volume, and the molar heat of vaporization of the liquid lubricant, respectively.

Descriptors: *Oil reservoirs, *Lubricants, *Reservoirs, *Bearings, Thermodynamics, Lubrication, Replenishment, Nylon, Capillarity, Transport properties, Temperature control, Gradients, Heat, Methodology, Porous materials, Surface properties, Surface temperature, Interfacial tension, Heat of vaporization, Spacecraft, Spaceborne, Feeding, Surfaces, Pressure, Mechanical components, LaPlace transformation, Temperature

Identifiers. Kelvin equation, NTISDODXA, NTISDODAF

AD-A017 502/6ST NTIS Prices: PC$3.50/MF$2.25

Particulate and Solar Radiation Stable Coating for Spacecraft

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

Patent Application.
AUTHOR: Slemp, W. S.
C5403G2 Fld: 11C, 90B, 71E STAR1320
Filed 16 May 75 8p
Rept No: PAT-APPL-578 240, NASA-CASE-LAR-10805-2
Monitor: 18
Government-owned invention available for licensing. Copy of application available NTIS.

Abstract: A laminate thermal control coating for spacecraft comprised of a layer of solar radiation stable film, a layer of particulate radiation stable film applied to the upper surface of the solar radiation stable film, and a layer of reflecting material applied to the lower surface of the solar radiation stable film is proposed. The coating experiences no increase in solar radiation absorbtance upon exposure to particulate or solar radiation as the particulate radiation is substantially absorbed in the particulate radiation stable layer. The solar radiation partially absorbed by the particulate radiation stable layer is transmitted by the solar radiation stable film to the reflecting material which reflects it back through the laminate and into space.

Descriptors: *Solar radiation, *Spacecraft design, *Thermal control coatings, *Patent applications, Absorption, Laminates

Identifiers: NTISNASA

N75-29431/4ST NTIS Prices: PC$3.25/MF$2.25

The Control of Carbon Dioxide Cryodeposits

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Sharpe, E. L.
C2183F2 Fld: 20M STAR1201
Nov 73 32
Rept No: NASA-TN-D-7334, L-8884
Monitor: 18

Abstract: An experimental study has been conducted to investigate the parameters affecting the cryodeposition of carbon dioxide frost. In the investigation carbon dioxide frost was cryodeposited from a helium-carbon dioxide mixture into a layer of fibrous insulation surrounding a cylindrical cryogenic tank. Results of the study indicated that not only did deposition occur on the frost surface but also within the frost layer. Over the range of variables investigated both the frost density and the mass of frost deposited were most sensitive to the time of deposition, the percent of carbon dioxide in the purge-gas mixture, and the thickness of the insulation. Frost density and mass of frost deposition were found to increase with time and percent carbon dioxide, and to decrease with increasing insulation thickness. (Author)

Descriptors: *Carbon dioxide, *Cryodeposits, *Frost, *Thermal protection, Helium, Liquid hydrogen, Propellant tanks, Thermal insulation

Identifiers: NASA

N74-10860/6 NTIS Prices: PC$3.00/MF$1.45

Studies Relating to Temperature Control of a Large Scale Telescope

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Katzoff, S.
C0663D2 Fld: 17H, 63F STAR1107
Feb 73 63p
Rept No: NASA-TN-D-7174, L-8741
Monitor: 18

Abstract: Analytical methods are developed for estimating the circumferential and longitudinal temperature distributions in a large space telescope, idealized as a simple insulated tube with a flat mirror across one end. The effects of wall conduction, multilayer insulation, thermal coatings, heat pipes, and heated collars are analyzed, with numerical examples. For most of the study, the only thermal input to the tube was assumed to be from steady solar irradiation from one side, as in a geosynchronous orbit. Unsteady heat flow through the insulation, as in alternating sunlight and shadow of a low orbit, is briefly discussed. (Author)

Descriptors: *Astronomical telescopes, *Mathematical models, *Temperature control, Heat pipes, Integral equations, Multilayer insulation, Radiative heat transfer, Temperature distribution, Thermal control coatings

Identifiers: NASA

N73-16931 NTIS Prices: PC$3.00/MF$0.95

Investigation of Phase-Change Coatings for Variable Thermal Control of Spacecraft

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Kelliher, W. C.; Young, P. R.
A5001D4 Fld: 11C, 71E, 84C STAR1016
Jun 72 20p
Rept No: NASA-TN-D-6756, L-6283

Abstract: An investigation was conducted to determine the feasibility of producing a spacecraft coating system that could vary the ratio of its solar absorptance to thermal emittance to adjust automatically for changes in the thermal balance of a spacecraft. This study resulted in a new concept called the phase-change effect which uses the change that occurs in the optical properties of many materials during the phase transition from a crystalline solid to an amorphous material. A series of two-component model coatings was developed which, when placed on a highly reflecting substrate, exhibited a sharp decrease in solar absorptance within a narrow temperature range. A variable thermal control coating can have a significant amount of temperature regulation with the phase-change effect. Data are presented on several crystallite-polymer formulations, their physical and optical properties, and associated phase-change temperatures. Aspects pertaining to their use in a space environment and an example of the degree of thermal regulation attainable with these coatings is also given. (Author)

Descriptors: *Spacecraft structures, *Temperature effects, *Thermal control coatings, Phototropism, Product development, Spacecraft environments, Thermodynamic properties

N72-25924 NTIS Prices: PC$3.00/MF$0.95

Vacuum and Ultraviolet Radiation Effects on Binders and Pigments for Spacecraft Thermal Control Coatings

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Progar, D. J.; Wade, W. R.
A3934B4 Fld: 11C, 71E STAR1003
Nov 71 42p
Rept No: NASA-TN-D-6546, L-7722

Descriptors: *Protective coatings, *Thermal control coatings, *Ultraviolet radiation, *Vacuum effects, Pigments, Radiation effects, Silicone resins

N72-12941 NTIS Prices: PC$3.00/MF$0.95

An Experimental Investigation of Three Balloon-Type Enclosures for Thermal Control of Satellites

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Sweet, G. E.
A2795G4 Fld: 13A, 69A STAR0916
Jun 71 47
Rept No: NASA-TN-D-6224, L-7015
Contract: 124-09-26-03

Descriptors: *Balloons, *Satellite configurations, *Thermal protection, *Thermal vacuum tests, Inflatable spacecraft, Manned orbital telescopes, Radiometers, Skin temperature (non-biological), Thermal control coatings

N71-28074 NTIS Prices: PC$3.00 MF$0.95

The Effects of Proton Irradiation Rate on the Solar Transmittance of a Thermal Control Binder Material

Arnold Engineering Development Center Arnold Air Force Station Tenn (042550)

Final rept. 4 Nov 69-15 May 70
AUTHOR: Kirby, W. G.; Mills, D. W. Jr
A1364K3 Fld: 18H, 71L USGRDR7103
Dec 70 37p
Rept No: ADEC-TR-70-257
Contract: F40600-71-C-0002
Project: ARO-SW3005
Prepared in cooperation with ARO, Inc., Tullahoma, Tenn. Rept. no. ARO-VKF-TR-70-283.

Abstract: An experimental investigation was conducted to study the effect of proton irradiation rate on the solar transmittance of a silicone rubber under a 10 to the -8th torr vacuum. Measurements were made with 150-kev protons. The effect of vacuum on the solar transmittance of the test material was negligible. The solar transmittance of the material appeared to decrease with decreasing irradiation rate. The solar transmittance of all samples was a power law function of the total energy accumulated per unit area of the sample between total energy levels of 10 to the 8th and 10 to the 10th ergs/sq cm/sec. (Author)

Descriptors: (*Silicones, *Proton bombardment), Space environmental conditions, Test methods, Radiation damage, Optical properties

Identifiers: Transmittance

AD-715 673 NTIS Prices: PC$3.00 MF$0.95

AN EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF BALLOON-TYPE ENCLOSURES FOR THERMAL CONTROL OF SATELLITES

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Sweet, G. E.
6443J3 Fld: 22B, 944 STAR0715
Jun 69 55p
Rept No: NASA-TN-D-5230
Contract: 124-09-18-06-23

Descriptors: *Artificial satellites, *Balloons, *Inflatable structures, *Temperature control, Performance prediction, Performance tests, Satellite control

N69-28209 CFSTI Prices: HC$6.00 MF$0.95

ANALYTICAL STUDY OF A SOLAR DEGRADATION MODEL FOR THERMAL CONTROL MATERIALS AND SOME RAMIFICATIONS FOR ACCELERATEC SOLAR RADIATION TESTING

Arnold Engineering Development Center Arnold Air Force Station Tenn (042550)

Final rept. Sep 66-Dec 67
AUTHOR: Smith, A. M.; Lee, A. Y.
5125D3 Fld: 22B, 3B USGRDR6822
Sep 68 40p
Rept No: AEDC-TR-68-175
Contract: F40600-69-C-0001
Project: ARO-ST0802
Prepared in cooperation with ARO, Inc., Tullahoma, Tenn.

Abstract: A photoreaction-diffusion model for the solar degradation of thermal control materials is mathematically formulated and analyzed. The governing differential equation for the concentration of defect specie created in the material by radiation is derived, and an analytical solution is obtained for appropriate boundary conditions. From this solution for the concentration of the ith-type defects, an analytical expression is derived for the number of ith-type defects present in a material layer of depth x and unit irradiated area. These analytical relations are used to predict the radiation-induced increase in the absorption coefficient and absorption optical thickness of a hypothetical thermal control material exposed to damaging ultraviolet irradiance equal to that of the sun. The solutions are also used to better define the environmental parameters which must be controlled during solar radiation testing of thermal control coatings. For example, the time-irradiance reciprocity principle often employed in acceleratec solar testing is investigated by use of the aforementioned solutions and is found to be invalid for materials which degrade according to the photoreaction-diffusion model. (Author)

Descriptors: (*Spacecraft, Solar radiation), (*Solar raciation, Degradation), Materials, Thermal properties, Control, Winc tunnel models, Mathematical models, Predictions, Coatings, Ultraviolet radiation, Simulation, Space environmental conditions

Identifiers: *Thermal control materials, Skin(Structural)

AD-675 140 CFSTI Prices: PC$6.00 MF$0.95

THERMAL CONTROL CONSIDERATIONS FOR A MANNED ORBITING SPACE STATION

National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
AUTHOR: Taylor, J. T.
3523G1 Fld: 22A STAR0514
May 67 48p
Rept No: NASA-TN-D-3995
Contract: 981-10-10-05-72
Monitor: 18

Descriptors: *Heat flux, *Manned orbital space station (moss), *Space radiator, *Temperature control, *Thermal property, Activity, Analysis, Balance, Coating, Control, Electric, Equilibrium, Flux, Heat, Load, Passive, Power, Property, Radiator, Space, Temperature, Thermal

N67-26551 CFSTI Prices: PC$6.00 MF$0.95

SPACE PROGRAMS SUMMARY NO. 37-42, VOLUME III FOR THE PERIOD SEPTEMBER 1, 1966 TO OCTOBER 31, 1966. DEEP SPACE NETWORK

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
3084F3 Fld: 9F, 22A STAR0506
30 Nov 66 138p
Rept No: NASA-CR-81209, JPL-SPS-37-42, VOL. III
Contract' NAS7-100
Monitor: 18

Descriptors: *Deep space, *Instrumentation program, *Navigation and guidance, *Radio communication, *Space station, *Spacecraft tracking, Acceleration, Antenna, Calibration, Communication, Control, Deep, Digital, Doppler effect, Engineering, Entry, Facility, Frequency, Generation, Guidance, Instrumentation, Mars, Matrix, Navigation, Network, Noise, Orbit, Pioneer project, Program, Radio, S-band, Space, Spacecraft, Station, Thermal, Tracking, Venus, X-band

N67-15901 CFSTI Prices: PC$6.00 MF$0.95

AN ANALOG STUDY OF THE PASSIVE THERMAL BEHAVIOR OF AN ORBITING SPACE STATION

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Clark, L. G.; Wilson, J. W.
1065C2 Fld: 22A STAR0423
Oct 66 38p
Rept No: NASA-TN-D-3654

Descriptors: *Analog computer, *Orbital space station, *Thermal environment, Control, Crew, Equation, Fourier analysis, Heat transfer, Linear, Module, Spacecraft, Study, Surface, Wall

N66-38414 CFSTI Prices: PC$6.00 MF$0.95

THERMAL INTEGRATION OF ELECTRIC POWER AND LIFE SUPPORT SYSTEMS FOR MANNED SPACE STATIONS

General Electric Co., Philadelphia, Pa. Missile anc Space Div.
AUTHOR: Erlanson, E. P.; Woods, R. W.
1051B3 Fld: 10B STAR0421
Sep 66 323p
Rept No: NASA-CR-543
Contract: NAS3-6478

Descriptors: *Life support system, *Manned orbital space station (moss), *Power supply, Attitude, Control, Electric power, Environment, Integration, Life, Manned, Moss, Orbital, Power, Space station, Supply, Support, System, Thermal

N66-36109 CFSTI Prices: PC$6.00 MF$0.95

DEVELOPMENT OF AN EXPANDABLE AIRLOCK UTILIZING THE ELASTIC RECOVERY PRINCIPLE

National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTHOR: Williams, J. G.
0913G4 Fld: 22B STAR0411
1965 32p
Rept No: NASA-TM-X-56354
Presented At the Aerospace Expandable Struct. Conf., Minneapolis, 25-27 May, 1965

Descriptors: *Air lock, *Expandable structure, *Foamec material, *Potential energy, Air, Control, Deployment, Design, Elastic, Energy, Expansion, Foam, Lock, Material, Micrometeoroid, Packaging, Penetration, Polyester, Potential, Recovery, Resistance, Stress-strain, Structure, Thermal

N66-22259 CFSTI Prices: PC$6.00 MF$0.95

User1277   Date:20sep77   Time: 6:17:37   File: 6

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2	4726	SERIAL# UEI
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4	23	1*2
5	1	2*3
6	200	SERIAL# UEJ
7	1	25(W)KW
8	6	POWER(W)MODULE

Print 7/5/1
Print 8/5/1-6

Search Time: 0.113   Prints: 7   Descs.: 17

C-3

25 kw tacan transmitter assembly

Maxson Electronics Corp Great River N Y (000000)

Final rept.
AUTHOR: Rosen, Arnold
1633B2 USGRDR6512
Feb 65 2p
Contract: ARDS630
Project: 115 47D
Monitor: SRDS-RD-64-151

Abstract: TACAN is an aircraft-to-ground beacon navigation system which provides to aircraft, over large areas, the azimuth angle and the range of the aircraft to the ground beacon. This report describes the work that was accomplished towards the development of a 25-kilowatt peak power TACAN transmitter ground beacon using negative grid tubes. A technique for obtaining a desired output spectrum from an RF amplifier by making an envelope comparison with a stable reference was postulated. The use of this technique would allow a TACAN Transmitter to be constructed without the spectrum control filter that is currently used. This program has shown it is possible to control a transmitter spectrum by the use of this feedback technique. The test results obtained at 22 kw were sideband ratios of 48 to 49 db. Subsequent to the suspension of this program additional tests were performed at a 13-kw level. The amplifier was constructed of a chain of ceramic coaxial tetrodes. The tubes are capable of delivering the desired output power of 25 kilowatts. Operating with low, fixed plate and screen voltages results in a very small pulse modulator and a reduction in d-c power requirements. A broadband frequency multiplier was developed which simplifies tuning procedures in changing the transmitter from one operating channel to another.

Descriptors: (*RADIO NAVIGATION, RADIO TRANSMITTERS), (*RADIO TRANSMITTERS, RADIO NAVIGATION), (*AIR TRAFFIC CONTROL SYSTEMS , RADIO NAVIGATION), RADIO BEACONS, GROUND SUPPORT EQUIPMENT, TETRODES, RADIOFREQUENCY AMPLIFIERS, FEEDBACK, CIRCUITS, WIRING DIAGRAMS

Identifiers: TACAN

AD-614 841 CFSTI Price: PC$3.00

Development of an Integrated Power Module Inverter

Motorola Inc Phoenix Ariz Semiconductor Products Div (237670)

Final technical rept. 9 Sep 74-30 Oct 76 on type 3.
D1714A1 Fld: 10B, 9E, 49B GRAI7709
30 Oct 76 112p
Contract: DAAK02-75-C-0101
Monitor: 18
Prepared in cooperation with Rec-Tec, Inc., Fairfield, Conn.

Abstract: This research project was established to provide a cost effective, reliable and efficient converter using an integrated power switch with pulse width modulation techniques. Low cost, light weight and efficient converter systems are highly suitable and offer weight and quality advantages in portable frequency conversion and power control systems. This particular program is for the development of a 15KW three phase inverter system which can convert unregulated, poor quality, input power into, good quality, three phase power at 50, 60 and 400Hz. Much success has been achieved toward the intended objectives and the program. However, it must be recognized that when a radically new technology using techniques which effectively reduce system weight as much as 67%, some problems arise which reduce the available time to allow for completion of all goals set forth in this best efforts program. This report states what was accomplished, how it was accomplished, and conclusions and recommendations for further work effort.

Descriptors: *Inverters, *Power conditioning, *Modules(Electronics), Integrated systems, Electronic switches, Microcomputers, Electric filters, Feedback, Control, Machine coding, Weight reduction

Identifiers: NTISDODXA

AD-A035 815/0ST NTIS Prices: PC A06/MF A01

Facility Simulation Model for Advanced BMD Systems. Volume IVC. Power Module: Program Listing

Army Construction Engineering Research Lab Champaign Ill (405279)

Final rept.
AUTHOR: Kao, A.; Blackmon, R.; McDowell, E.; Eng, D.
C4874C1 Fld: 15C, 9B, 74B GRAI7517
Apr 75 45p
Rept No: CERL-TR-C-28-Vol-4C
Project: DA-4-A664717-C-895
Task: 4-A-664717-D-89502
Monitor: 18
See also Volume 4B, AD-A009 748.
Availability: Available in microfiche only.

Abstract: This Power Module volume is divided into a user's manual, a program reference manual, and a program listing. In this program listing, the FORTRAN program of one program in the Power Module is documented. This is Program PCWERM.

Descriptors: *Antimissile defense systems, *Hardenec structures, *Power supplies, *Computerized simulation, Diesel engines, Gas turbines, Fuel cells, Electric batteries, Turbogenerators, Alternators, FORTRAN, Computer programs

Identifiers: POWERM computer program, NTISDODA

AD-A011 231/8ST NTIS Prices: MF$2.25

Facility Simulation Model for Advanced BMD Systems. Volume IVA. Power Module: User's Manual

Army Construction Engineering Research Lab Champaign Ill (405279)

Final rept.
AUTHOR: Kao, A., Blackmon, R.; Eng, D.; McDowell, E.
C4874B1 Fld: 15C, 9B, 74B GRAI7517
Apr 75 53p
Rept No: CERL-TR-C-28-Vol-4A
Project: DA-4-A664717-D-895
Task: 4-A-664717-D-89502
Monitor: 18
See also Volume 3C, AD-A010 713, and Volume 4B, AD-A009 748.

Abstract: This Power Module Volume is divided into a user's manual, a program reference manual, and a program listing. In this user's manual, input formats are outlined for each power system: diesel engine, gas-turbine engine, turbo-alternator, fuel cells, and batteries. The module calculates the performance characteristics of each system and also selects commercially available power systems from a data base for both diesel and gas-turbine to meet the power output requirements. Five sample problems, one for each power system, illustrate the use of the Power Module.

Descriptors: *Antimissile defense systems, *Hardenec structures, *Power supplies, *Computerized simulation, Diesel engines, Gas turbines, Fuel cells, Electric batteries, Turbogenerators, Alternators, FORTRAN, User needs

Identifiers: NTISDODA

AD-A011 227/6ST NTIS Prices: PC$4.25/MF$2.25

Facility Simulation Model for Advanced BMD Systems. Volume IVB. Power Module. Program Reference Manual

Army Construction Engineering Research Lab Champaign Ill (405279)

Final rept.
AUTHOR: Kao, A.; Blackmon, R.; Eng, D.; McDowell, E.
C4704F3 Fld: 15C, 9B, 74B GRAI7514
Apr 75 49p
Rept No: CERL-TR-C-28-Vol-4B
Project: DA-4-A-664717-D-895
Task: 4-A-664717-D-89502
Monitor: 18
See also Volume 3A dated Apr 75, AD-A009 747.

Abstract: The Power Module volume is divided into a user's manual, a program reference manual, and a program listing. In this program reference manual, the procedures for calculating the performance characteristics of five power systems are described. The five power systems are: diesel engine, gas-turbine engine, turbo-alternator, fuel cells, and batteries. Descriptions of computer programs for each system are also given.

Descriptors: *Antimissile defense systems, *Hardened structures, *Computerized simulation, Heating, Ventilation, Air Conditioning equipment, Facilities, Cost analysis, Underground facilities, Underground structures, User needs, Power equipment, Computer programming

Identifiers: NTISDODA

AD-A009 748/5ST NTIS Prices: PC$3.75/MF$2.25

A Digital Regulated Solar Array Power Module

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AUTHOR: Triner, J. E.
A2882B1 Fld: 10A, 67F STAR0917
Jul 71 19p
Rept No: NASA-TM-X-2314, E-6215
Contract: 120-26

Descriptors: *Circuits, *Digital techniques, *Performance, *Solar cells, Phototransistors, Power supply circuits, Voltage regulators

N71-29904 NTIS Prices: PC$3.00 MF$0.95

560-WATT PORTABLE THERMOELECTRIC POWER MODULE

Minnesota Mining and Mfg Co St Paul Isotope Power Products (403309)

Final rept.
AUTHOR: Nystrom, T. L.; Stauffer, J. H.; Pitcher, E. W.
4152K4 Fld: 10B USGRDR6803
Sep 67 57p
Contract: DA-44-009-AMC-1607(T)

Abstract: The objective of the research and development program is the design, fabrication, testing and delivery of a thermoelectric power module with the following principal requirements: Power - 560 watts at 28 volts dc; Weight - 35 pounds or less; Fuel - JP-4, CITE, or diesel fuels logistically available to the U.S. Army; Life - Continuous or intermittent operation of at least 1000 hours; Noise Level - Inaudible at a distance of 100 feet. A power module was delivered which demonstrates compliance with these requirements. (Author)

Descriptors: (*Thermoelectricity, *Power supplies), (*Generators, Thermoelectricity), (*Electric power production, Thermoelectricity), Portable, Heaters, Fuel systems, Performance(Engineering)

Identifiers: Thermoelectric generators

AD-662 770 CFSTI Prices: PC$6.00 MF$0.95

User1277   Date:20sep77   Time: 6:39:01   File: 8

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  8     5 5*6
  9   447 SERIAL# UEJ
 10    25 25(W)KW
 11     0 9*10
 12    10 4*9
 13     1 6*9
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Print 8/5/1-5
Print 10/5/1-25
Print 12/5/1-10
Print 13/5/1

Search Time: 0.357   Prints: 71   Descs.: 17

ID NO.- EI770749139 749139
DEFINITION OF A CRYOGENIC HEAT PIPE EXPERIMENT.
Kroliczek, Edward J.
B & K Eng Inc, Towson, Md
Int Heat Pipe Conf, 2nd, Bologna, Italy, Mar 31-Apr 2 1976 Publ by Eur Space Agency (ESA SP112), Noordwijk, Neth, 1976 v 1 p 673-682
DESCRIPTORS: (*HEAT PIPES, *Testing), (SPACECRAFT, Temperature Control),
CARD ALERT: 641, 655
NASA-GSFC is currently planning a flight experiment to verify the performance of cryogenic heat pipes in a $left double quote$ 0-g $right double quote$ space environment. During the past year, a number of potential flight opportunities have been investigated. The objective was to identify suitable flight vehicles and to develop an experiment package capable of providing flight data for at least two types of heat pipes: a transporter heat pipe and a thermal diode heat pipe. Each heat pipe will be tested in various operating modes. Performance data obtained from the experiment will be applicable to the design for cryogenic heat pipe systems, including applications where periodic high radiator temperatures are experienced as a result of cyclic energy inputs.

ID NO.- EI770749094 749094
ESA HEAT PIPE TECHNOLOGY PROGRAMME.
Accensi, A.
Eur Space Res & Technol Cent, Noordwijk, Neth
Int Heat Pipe Conf, 2nd, Bologna, Italy, Mar 31-Apr 2 1976 Publ by Eur Space Agency (ESA SP112), Noordwijk, Neth, 1976 v 1 p 655-660
DESCRIPTORS: (*HEAT PIPES, *Applications), (SPACECRAFT, Temperature Control),
CARD ALERT: 641, 655
The objective of the ESA heat pipe technology program is to define the requirements of current and future spacecraft missions and to provide qualified heat pipes and heat pipe systems for a wide range of foreseeable spacecraft applications. These applications include heat transfer systems to interface between equipment and radiators, advanced thermal control systems and radiators and $left double quote$ cold plates $right double quote$ for mounting equipment. 15 refs.

ID NO.- EI760963398 663398
THERMAL CONTROL SYSTEMS FOR LOW TEMPERATURE SHUTTLE PAYLOADS.
Wright, J. P.; Trucks, H.
Rockwell Int, Downey, Calif
ASME Pap n 76-ENAs-65 for Meet Jul 12-15 1976, 12 p
CODEN: ASMSA4
DESCRIPTORS: (*SPACE SHUTTLES, *Temperature Control), LOW TEMPERATURE ENGINEERING,
IDENTIFIERS: HEAT PIPE RADIATORS
CARD ALERT: 644, 655
Many of the scientific instruments and the components of the over 200 potential payloads that may be flown by the Space Shuttle system will have common requirements for very low operating temperatures (below 200 K) and for operational lifetimes of one to five years. A study was performed to determine and evaluate thermal control system concepts for various cooling categories in the 3 to 200 K temperature range based on commonality of cooling requirements. A further objective of the study was to develop technology and hardware development plans for the recommended cooling system concepts. Low temperature instruments primarily consisted of short wavelength and long wavelength infrared sensors and spectrometers, and cryogenically cooled magnetic spectrometers. A broad spectrum of potential cooling concepts were investigated including open-cycle (expendables), closed-cycle (mechanical), solid-state, and radiative cooling systems. All concepts were evaluated for the identified cooling categories of temperature level, cooling load, and operational life. Emphasis was placed on long duration (one to five-year) systems where technology needs are the most acute. Results of parametric performance analyses for selected cooling systems are presented, and the general conclusions derived from the study are discussed. It was found that a technology gap exists in the area of cooling systems for long duration missions (1- to 5-year) with temperature requirements below the lower limits for passive radiator systems. 6 refs.

ID NO.- EI760963394 663394
EFFECT OF RADIATION TRAPPING WITHIN THE SPECULAR CAVITY FORMED BY THE SHUTTLE FORWARD RADIATORS AND PAYLOAD BAY DOOR.
Scheps, P. R.; Howell, H. R.
Vought Corp, Dallas, Tex
ASME Pap n 76-ENAs-55 for Meet Jul 12-15 1976, 8 p CODEN: ASMSA4
DESCRIPTORS: (*SPACE SHUTTLES, *Radiation Hazards), RADIATORS, (HEAT TRANSFER, Radiation),
CARD ALERT: 655, 641
The Space Shuttle forward radiator panels, in their deployed position, form a cavity with the payload bay door. The specular nature of the silver-Teflon material used to coat the panels and door potentially adds a trapped radiation component to the absorbed solar and IR environmental flux. The nature and impact of this cavity trapping on the performance of the Shuttle Active Thermal Control System was the subject of an experimental test program reported here. A full-scale, rotatable, non-flowing representation of the forward panel and the associated portion of the payload bay door was constructed and subjected to extensive testing using Xenon lamps capable of simulating solar irradiation of the entire (2. 1-x 4. 6-m) cavity opening. Radiation exchange factors between thermally insulated zones on the test article and between these zones and the chamber were experimentally determined. These exchange factors were used to experimentally determine the absorbed flux as a function of depth into the cavity. This absorbed heat spatial distribution was compared to analytical predictions made by assuming a purely diffuse coating. The conclusions of the experimental program indicate that the cavity trapping is a significant contribution to the total absorbed radiation in the cavity. An approximation is devised to allow specular predictions to be made by adjusting the surface properties used in the purely diffuse model. 7 refs.

ID NO.- EI760963388 663388
AUXILIARY PAYLOAD POWER SYSTEM THERMAL CONTROL.
Nagel, R. G.
McDonnell Douglas Astronaut Co $EM DASH$ East St. Louis, Mo
ASME Pap n 76-ENAs-59 for Meet Jul 12-15 1976, 11 p CODEN: ASMSA4
DESCRIPTORS: (*SPACE SHUTTLES, *Auxiliary Power Systems), (SPACE VEHICLES, Temperature Control), HEAT SINKS,
CARD ALERT: 641, 655
The Auxiliary Payload Power System (APPS) provides supplementary power and cooling to Space Processing Application (SPA) experiments to be mounted in the APPS and the Spacelab in the Shuttle Payload Bay. SPA experiment operations are planned for early Shuttle flights. This paper presents thermal control study results for preliminary analysis and design definition of the APPS. A 100-m**2, three-wing, pumped-fluid, deployable radiator with separate APPS equipment and SPA experiments coolant loops was selected as the baseline. The system is capable of rejecting the heat (approximately 26 kw) associated with the production and consumption of approximately 16 kw of electrical power produced by the APPS fuel cells for a worst case radiator orientation. For the most favorable orientation, the heat rejection and power capability approach 38 and 24 kw, respectively. Alternate approaches were evaluated, such as heat pipes for the radiator and alternate fluids for the coolant loops. Emphasis was placed on using Shuttle developed hardware: coolant pumps, heat exchangers, fluids, and radiator technology.

ID NO.- EI760856166 656166
DEVELOPMENT TESTING OF A SELF-CONTAINED HEAT REJECTION MODULE.
Fleming, M. L.
Vought Corp, Dallas, Tex
ASME Pap n 76-ENAs-33 for Meet Jul 12-15 1976, 8 p CODEN: ASMSA4
DESCRIPTORS: (*SPACE VEHICLES, *Temperature Control), (SPACE RESEARCH, Simulation Chambers), REFRIGERATION,
CARD ALERT: 644, 655, 656, 657
This paper discusses the thermal vacuum testing of a Self-Contained Heat Rejection Module (SHRM) currently being developed for use with Shuttle payloads and future spacecraft. Two weeks of testing were conducted in the NASA Johnson Space Center Space Environment Simulator Laboratory. The testing included demonstration of deployable spacecraft radiators with fluid swivels, variable return temperatures, and a dual-mode pumped fluid radiator/vapor compression refrigeration system. In addition, an evaluation was made of a contact heat exchanger used as the intercooler. The test articles and systems are described and the test planning and objectives discussed. A summary of the significant results of the testing and conclusions drawn from the testing are presented. Component evaluations based on the test results indicated all the components performed as expected except for one of the eight fluid swivels. A redesign of this component will be necessary for use in a dual-mode system.

ID NO.- EI760530967 630967
FERROELECTRIC THERMAL RADIATORS WITH HIGH TEMPERATURE STABILITY.
Ivanov, I. V.; Gus'kov, V. P.; Yakunin, V. G.
Sov J Opt Technol v 42 n 6 Jun 1975 p 345-346 CODEN: SJOTBH
DESCRIPTORS: (*FERROELECTRIC DEVICES, *Temperature Control),
CARD ALERT: 708, 714, 731, 944
Discusses a thermal radiator in the form of a ferroelectric body with an internal cylindrical channel, operating in the resonance automatic temperature stabilization condition and providing a high radiation temperature stability. During operation the radiation temperature remains practically constant while the ambient temperature varies within several tens of degrees. 4 refs.

ID NO.- EI750959247 559247
DESIGN OF A HEAT PIPE GOVERNED THERMAL CONTROL SYSTEM FOR THE SOLAR ELECTRIC PROPULSION STAGE (SEPS).
Ruttner, L. E.; Wright, J. P.
Rockwell Int Corp, Downey, Calif
ASME Pap n 75-ENAs-53 for Meet Jul 21-24 1975, 11 p CODEN: ASMSA4
DESCRIPTORS: *HEAT PIPES, (SPACE VEHICLES, Temperature Control), (PROPULSION, Aerospace Applications),
IDENTIFIERS: SOLAR ELECTRIC PROPULSION
CARD ALERT: 641, 655
A 2200-w capacity spacecraft heat rejection system utilizing heat pipe radiator panels has been investigated. The system was designed for SEPS which is planned for a wide range of high energy missions (Encke Rendezvous, Mercury Orbiter), various outer planet flybys and geosynchronous applications. The total thermal control system consists of two radiator panels connected to the heat source by Variable Conductance Heat Pipes (VCHP's). The thermal control system was designed to operate in the 223 to 333 K temperature range. The radiators have an emittance of 0. 88 at their operational temperature and a fin efficiency of approximately 0. 80 (80 percent).

ID NO.- EI750748503 548503
SOLID STATE THERMAL CONTROL FOR SPACECRAFT.
Harpster, Joseph W. C.; Swinehart, Philip R.; Braun, Frank
Ohio Semitronics Inc, Columbus
Solid-State Electron v 18 n 6 Jun 1975 p 551-555 CODEN: SSELA5
DESCRIPTORS: (*SPACE VEHICLES, *Electric Equipment), (SOLID STATE DEVICES, Thermal Effects),
IDENTIFIERS: THERMOELECTRIC DEVICES
CARD ALERT: 655, 714
Thermoelectric devices (TED's) have adequate heat pumping capabilities even though they are of considerably lower efficiency than other thermal control methods. The limits of performance of TED's as thermal control elements for spacecraft in Earth orbit have been broadly defined by finding the maximum possible amount of heat flow with the TED's in operation, Q(max), and $DELTA$ Q(max), the maximum difference in heat flow obtainable between the conditions of TED's in operation and with zero electrical power input. In general, Q(max) and $DELTA$ Q(max) occur at different optimum input powers and different optimum TED-radiator geometries. 8 refs.

ID NO.- EI741174134 474134
SNAP 19 VIKING RTG FLIGHT CONFIGURATION AND INTEGRATION TESTING.
Brittain, Wayne M.; Christenbury, Silas T.
Teledyne Isot, Timonium, Md
Intersoc Energy Convers Eng Conf, 9th, Proc, San Francisco, Calif, Aug 26-30 1974 Pap 749110, p 185-192. Available from ASME, New York, 1974
DESCRIPTORS: *THERMOELECTRIC ENERGY CONVERSION,
CARD ALERT: 615
In this paper the Viking-75 mission environments and lander interface requirements which influence the design of the RTG, as well as RTG-related constraints are discussed. The baseline RTG design evolved from these considerations is presented with particular emphasis on the design features which make the Viking RTG unique. These features include a gas management system employing a separate gas reservoir to maintain the RTG hot junction and heat source temperatures within a desired range throughout the various mission phases, as well as a specially profiled housing/radiator assembly which facilitates both ground cooling of the RTG's prior to launch and thermal control of the lander after landing.

ID NO.- EI741172773 472773
NOCTURNAL WATER COOLING BY SKYWARD RADIATION IN ISRAEL.
Bar-Conen, A.; Rambach, C.
Ben Gurion Univ of the Negev, Beer Sheva, Isr
Intersoc Energy Convers Eng Conf, 9th, Proc, San Francisco, Calif, Aug 26-30 1974 Pap 749011, p 298-305. Available from ASME, New York, 1974
DESCRIPTORS: *RADIATORS, (SOLAR RADIATION, Collectors), SOLAR ENERGY,
IDENTIFIERS: SKYWARD RADIATOR
CARD ALERT: 643
The theoretical operational characteristics and limits of a closed-cycle, liquid cooling skyward radiator operating in Beer Sheva, Israel were studied by numerical solution of an idealized governing relation. Significant parametric trends, including variations in system thermal capacity, convective parameters and initial radiator temperature were explored to determine appropriate guidelines for future designs. The results establish the general feasibility of nocturnal radiator thermal control of structures in Beer Sheva, Israel. Furthermore, evaluation of the optimum thermal storage capacity suggests that effective skyward radiator cooling in Beer Sheva may require considerably shallower water ponds than used in similar systems in Phoenix, Arizona. 10 refs.

ID NO.- EI741170246 470246
PASSIVE CRYOGENIC COOLING OF ELECTROOPTICS WITH A HEAT PIPE/RADIATOR.
Nelson, Burke E.; Goldstein, Gerald A.
Perkin-Elmer Corp, Danbury, Conn
Appl Opt v 13 n 9 Sep 1974 p 2109-2111 CODEN: APOPAI
DESCRIPTORS: *HEAT PIPES, CONTROL, THERMAL VARIABLES, CRYOGENICS,
CARD ALERT: 641, 644, 944
The current status of the heat pipe is discussed with particular emphasis on applications to cryogenic thermal control. The competitive nature of the passive heat pipe/radiator system is demonstrated through a comparative study with other candidate systems for a 1-yr mission. The mission involves cooling a space-borne experiment to 100 K while it dissipates 10 W. 16 refs.

ID NO - EI741066022 466022
THERMAL ANALYSIS OF THE SKYLAB AIRLOCK MODULE.
Butin, R. L.; Donovan, M. B.
,McDonnell Douglas Astronaut Co, East, St. Louis, Mo
ASME Pap n 74-ENAs-40 for Meet Jul 29-Aug 1 1974, 9 p CODEN: ASMSA4
DESCRIPTORS: (*SPACE VEHICLES, *Temperature Control),
IDENTIFIERS: THERMAL MODELING, SKYLAB
CARD ALERT: 655
The mathematical analyses were performed using the Airlock Thermal Model (ATOM), a computerized simulation of energy exchange among the major Airlock Module structure, atmospheric control system, ATMC&D Panel/EREP cooling system, EVA/IVA suit cooling systems, and the space radiator coolant system. Input parameters to the model include vehicle internal heat loads (compartment loads, electronic equipment waste heats and metabolic loads), system operating modes, vehicle configuration, and external orbital thermal radiation. Although primarily developed as an analytical tool for design purposes, the thermal mode has continued to be used in Skylab mission support activities. Flight data are compared with the thermal predictions for a variety of flight conditions. Problem areas are discussed and recommendations made for future space systems thermal modeling. 9 refs.

ID NO.- EI741066019 466019
INTERDEPENDENCE OF THE AIRLOCK MODULE/ORBITAL WORKSHOP THERMAL CONTROL AND ELECTRICAL POWER SYSTEMS ON SKYLAB.
Markus, J. A.
McDonnell Douglas Astronaut Co, East, St. Louis, Mo
ASME Pap n 74-ENAs-35 for Meet July 29-Aug 1 1974, 9 p CODEN: ASMSA4
DESCRIPTORS: (*SPACE VEHICLES, *Power Supply), (SOLAR RADIATION, Collectors), (SOLAR CELLS, Arrays),
IDENTIFIERS: SKYLAB, AIRLOCK THERMAL CONTROL, ELECTRICAL POWER
CARD ALERT: 655, 657, 702
The basic Airlock Module/Orbital Workshop electrical power system consisted of solar arrays, rechargeable nickel cadmium batteries, battery chargers, and voltage regulators. Thermal control played a major role in performance of this system since power output of the solar arrays and batteries varies with their temperature. The solar array temperature control system was limited to a passive radiator surface on the backside of the array panels. Solar panels experience a large temperature variation as Skylab alternately passes through direct sunlight and earth shadow. An extensive test program of the nickel cacmi battery was accomplished to establish thermal/electrical performance of the components and system. Parametric data from battery testing were reduced to empirical battery performance equations. Extensive experience gained throughout development of the thermal/electrical system and computer simulations is reviewed in this paper. 3 refs.

ID NO.- EI741066001 466001
SHUTTLE ACTIVE THERMAL CONTROL SYSTEM DEVELOPMENT TESTING.
Fleming, M. L.; Howell, H. R.; Dietz, J. B.; Reed, M. W.
LVT Aerosp Corp, Dallas, Tex
ASME Pap n 74-ENAs-43 for Meet Jul 29-Aug 1 1974, 11 p
CODEN: ASMSA4
DESCRIPTORS: (*SPACE SHUTTLES, *Temperature Control), HEAT EXCHANGERS, PROTECTIVE COATINGS,
IDENTIFIERS: RADIATOR PANELS
CARD ALERT: 616, 655
A series of system development tests were conducted on potential Shuttle active thermal control systems in the NASA Johnson Space Center Space Environment Simulator Lab. Included in this testing were tests of systems composed of several flow arrangements of eight radiator panels of a modular design. Also included were tests of systems composed of the eight radiator panels operating in combination with an evaporative heat sink. In addition, coatings evaluation testings of a vapor-deposited-silver on Teflon coating was conducted to determine the adhesion capabilities of eight candidate adhesives under space simulated conditions and operational thermal cycles. The test articles and systems for these three tests are described and the test planning and objectives discussed. A summary of the significant results of the testing are presented.

ID NO.- EI741065529 465529
THERMAL DESIGN, ANALYSIS AND TEST OF THE ERTS-A SPACECRAFT.
Drummond, F. O.; Blomstrom, L. E.
GE, Philadelphia, Pa
ASME Pap n 74-ENAs-59 for Meet Jul 29-Aug 1 1974, 9 p
CODEN: ASMSA4
DESCRIPTORS: (*SATELLITES, *Observatories), TEMPERATURE CONTROL,
CARD ALERT: 655, 731, 944
The thermal design, analysis, and test of the Earth Resources Technology Satellite (ERTS-A) are presented and flight temperature predictions compared with flight performance. The temperature control requirements were to maintain a sink temperature for the payload and associated components of 20 C $plus or minus$ 10 C for payload duty cycles ranging from 0 to 20 percent. The requirements were met with a thermal design utilizing thermal coatings, multi-layer insulation, radiators, louvers, and electrical compensation heaters. A multi-node transient math model was established for the spacecraft and exercised to predict component temperatures and minimum and maximum thermal conditions. A solar thermal-vacuum thermal balance test of the entire spacecraft was performed to verify the adequacy of the thermal design to maintain spacecraft temperatures. The math model was adjusted to obtain maximum correlation with the test data and found to be a good representation of the spacecraft design. 5 refs.

ID NO.- EI741062791 462791
EVALUATION OF A LARGE SIZE, MODULAR HEAT PIPER/RADIATOR FOR CRYOGENIC THERMAL CONTROL.
Nelson, B. E.; Petrie, Ward
Perkin Elmer Corp, Danbury, Conn
ASME Pap n 74-ENAs-29 for Meet Jul 29-Aug 1 1974, 8 p
CODEN: ASMSA4
DESCRIPTORS: (*HEAT PIPES, *Testing), (SPACE VEHICLES, Instruments),
IDENTIFIERS: CRYOGENIC HEAT PIPE/RADIATOR, WICKING LIMITS
CARD ALERT: 641, 644, 655
A strong, current interest exists in cooling spaceborne devices to cryogenic temperatures (ca. 100K). Such devices include space communication lasers and infrared detectors for Earth resources. A cryogenic heat pipe, isothermalizing a space radiator, provides a very attractive, passive means of thermal control. It must, however, have low thermal resistance to provide design feasibility. The Lobar wicking Arrangement proved extremely efficient in previous experiments at 5 W. A series of experiments was, therefore, conducted on a very large cryogenic heat pipe/radiator to determine the wicking limits and performance at higher power levels. The current status of the ongoing program is described in this paper. Research goals of a 6-m-long space radiator, rejecting 20 W with a temperature drop or less than 2 K, have been met. Details of the design and experimental phases of the work are discussed in this paper. 9 refs.

ID NO.- EI740529945 429945
THERMAL VACUUM TEST OF SKYLAB ORBITAL WORKSHOP REFRIGERATION SUBSYSTEM.
Sun, F. W.; Deak, R. A.
McDonnell Douglas Astronaut Co, Huntington Beach,
NASA Spec Publ 336, 1973, for Conf, Space Simulation, 7th, Los Angeles, Calif, Nov 12-14 1973 p 7-18 CODEN: NSSPAW
DESCRIPTORS: (*SPACE VEHICLES, *Cooling), ENVIRONMENTAL CHAMBERS,
CARD ALERT: 423, 655
The facilities, test support equipment, and test setup of a thermal qualification test performed on a fully operational Refrigeration Subsystem (RSS) are described. This subsystem consists of a radiator, radiator thermal control unit, pump assembly, wardroom freezer, food freezer, urine freezer, urine chiller (simulated), water chiller, and electrical cold plate. These components and the connecting plumbing comprise one complete coolant loop of the refrigeration system thermally and is functionally equivalent to the flight system. Coolant is circulated through freezers and chillers accepting heat for rejection to space by radiation. Design features and thermal operating characteristics of the test specimen are discussed. Results are presented on radiator heat rejection performance, radiator/thermal capacitor integrated thermal performance, coolant temperature control and temperature control hardware, coolant pumping equipment, regenerative chilling equipment, freezers, chillers, etc. Redundancy features of the flight system are also discussed.

ID NO.- EI740313244 413244
ELECTRIC STORAGE HEATING FOR MULTI-FAMILY DWELLINGS.
Walcoff, Harvey
NY State Urban Dev Corp, New York
IEEE Ind Appl Soc, Annu Meet, 8th, Conf Rec, Pap, Milwaukee, Wis, Oct 8-11 1973 p 543-547. Publ by IEEE (73 CHO 763-31A), New York, 1973
DESCRIPTORS: (*HEATING, *Heat Storage), ELECTRIC POWER UTILIZATION, (ELECTRIC UTILITIES, Rates),
CARD ALERT: 643, 706
The four main types of electric storage heaters used in England today, i. e. , storage radiators, central hot air heating, thermal storage walls, and central hydronic heating, are described. Unless an off-peak rate is offered by the electrical utilities, however, such a scheme is not attractive in the U. S. , an exception being the use of the storage heater in conjunction with permissive load control equipment which can significantly reduce a master metered project peak power demand and thus save substantial sums of money, even with existing utility company rates.

ID NO.- EI731259902 359902
UEBER DAS MESSEN IN DER LICHTTECHNIK. $left bracket$ Measuring in the Lighting Technique $right bracket$.
Korte, Heinrich
Physikalisch-Technische Bundesanstalt, Braunschweig, Ger
Lichttechnik v 25 n 2 Feb 1973 p 59-61 CODEN: LITKAW
DESCRIPTORS: *UNITS OF MEASUREMENT, (ILLUMINATING ENGINEERING, Standards), (LIGHT, Measurement),
CARD ALERT: 707, 901, 941
The basic lighting engineering unit is discussec. Attention is drawn to efforts to abolish the candela as base unit. Considering the modern means used in control engineering, the Hefner lamp, as a possibility for realizing the base unit in illuminating engineering, has a better chance as an easily reproducible luminous intensity standard leading to smaller deviations in the base units of various laboratories than this is actually the case with the theoretically better definable thermal radiator at the temperature of solidification for platinum. Another method discussed at present for realizing the base unit in lighting engineering consists in the use of an exact receiver adapted to V($lambda$). Difficulties are also encountered with regard to agreement on various units derived from the base unit. As regards the luminous flux, variances up to 2% are noted between the different laboratories. Finally, the question of the standarc lamps best suited for measuring operations is discussed. It is stated that the variations in the measuring values for incandescent lamps under certain conditions can possibly be lowered by some of the discharge lamps. In German.

ID NO.- EI731259446 359446
UEBER DIE ENTWICKLUNG DES TEMPERATURKONTROLLSYSTEMS DER SONNENSONDE HELIOS. $left bracket$ Development of Temperature Control System for the $left double quote$ HELIOS $right double quote$ Solar Probe $right bracket$.
Lorenz, Werner
ENRO-Raumfahrttech, Bremen, Ger
Raumfahrtforschung v 17 n 4 Jul-Aug 1973 p 187-195 CODEN: RMFFA7
DESCRIPTORS: (*SPACE PROBES, *Temperature Control), SOLAR RADIATION,
CARD ALERT: 655, 657
The essential impact of the thermal control system on the general concept of the spacecraft is described anc substantiated. The components and materials of the thermal control system are discussed in view of the requirements they have to fulfill during the HELIOS mission. In particular the operation of new design elements for achieving a requirec directional emittance of radiator areas is explained. 2 refs. In German with English abstract.

ID NO - EI731049279 349279
DEVELOPMENT OF A CRYOGENIC HEAT PIPE RADIATOR FOR A DETECTOR COOLING SYSTEM.
Wright, J. P.; Pence, W. R.
Rockwell Int Corp, Downey, Calif
ASME Paper n 73-ENAs-47 for Meet Jul 16-19 1973, 12 p
CODEN ASMSA4
DESCRIPTORS: *HEAT PIPES, (SATELLITES, Temperature Control),
CARD ALERT: 641, 655
A passive space radiator utilizing heat pipes was developed at the Space Division of Rockwell International Corporation. The radiator system was designed to operate in the 125 to 140 K temperature range, and has a nominal net heat rejection capability of 12 w at 135 K. Design tradeoffs were conducted to support the selection of the materials and configuration of the radiator, shields, heat pipes, and thermal interfaces. Freon-14 was selected as the working fluid for the radiator heat pipes, and methane was selected for the header heat pipes. The primary factors in the design and configuration of the radiator and heat pipes were structural and thermal requirements, weight, fabrication, installation, and 1-g testing requirements. The final design and its predicted performance characteristics are presented. A prototype system will be tested in a thermal vacuum chamber in July 1973.

ID NO.- EI731049277 349277
DESIGN AND TEST OF A SELF-CONTROLLED HEAT PIPE RADIATOR.
Swerdling, Burt; Hembach, Richard
Grumman Aerospace Corp, Bethpage, Ny
ASME Paper n 73-ENAs-49 for Meet Jul 16-19 1973, 9 p
CODEN: ASMSA4
DESCRIPTORS: *HEAT PIPES, (SPACE VEHICLES, Temperature Control),
IDENTIFIERS: HEAT REJECTION SYSTEM
CARD ALERT: 641, 655
A 15,000-w spacecraft waste heat rejection system utilizing heat pipe radiator panels has been investigated. Of the several concepts initially identified, a series system was selected for more in-depth analysis. As a demonstration of system feasibility, a nominal 500-w radiator panel has been designed, built, and bench tested. The panel, which is a module of the 15,000-w system, consists of a Variable Conductance Heat Pipe (VCHP) header, and six isothermalizer heat pipes attached to a radiator. The thermal load to the VCHP is supplied by a Freon 21 liquid loop via an integral heat exchanger. This paper describes the results of the system studies and the radiator design. Also presented are test data on the VCHP, heat exchanger and isothermalizer heat pipes. 5 refs

ID NO.- EI730420876 320876
SPACE STATION ENVIRONMENTAL THERMAL CONTROL SYSTEM DEFINITION.
Cody, Joseph C.; Byke, R. M.; Stell, A. T.
NASA Marshall Space Flight Cent, Huntsville, Ala
Prog Astronaut Aeronaut, Fundam of Spacecr Therm Des v 29, MIT Press, Cambridge, Mass, 1972 p 579-599
DESCRIPTORS: (*SPACE VEHICLES, *Life Support Systems),
CARD ALERT: 655
The methods used to select and define an envirormental thermal control system (ETCS) for a 12-man space station are presented. The ETCS was defined to meet the space station program requirements and to require minimum resources for design, development, and qualification to support a 1977 launch. The design consits of an exterior radiator/fluid system with regenerative temperature control interfacing with an interior heat-transport water loop. The adequacy of the radiator design was verified by a parametric computer analysis that considered thermal coating degradation, vehicle attitude, docked module blockage, and variation in the solar constant, albedo, and earth emission. 3 refs.

ID NO.- EI730418482 318482
VARIABLE CONDUCTANCE HEAT-PIPE FLIGHT EXPERIMENT.
Kirkpatrick, J. P.; Marcus, B. D.
NASA Ames Res Cent, Moffett Field, Calif
Prog Astronaut Aeronaut, Fundam of Spacecr Therm Des v 29, MIT Press, Cambridge, Mass, 1972 p 505-527
DESCRIPTORS: (*HEAT PIPES, *Thermal Conductivity). (SATELLITES, Observatories),
CARD ALERT: 641, 655
A gas-controlled, variable conductance heat pipe, designated the Ames Heat Pipe Experiment (AHPE), has been qualified for flight aboard the Oribting Astronomical Observatory (OAO-C) scheduled for launch in May 1972. The AHPE will provide temperature stability for the spacecraft's On-Board processor (OBP) by maintaining the OBP platform/AHPE interface at 63 $plus or minus$ 5 F for large variations in power dissipation and incident energy. The paper discusses the thermal boundary conditions imposed by the OAO-C spacecraft which made the AHPE a particularly difficult design problem; the selection of a $left double quote$ hot $right double quote$, nonwicked reservoir for the containment of the noncondensing control gas (nitrogen); the effect of mass diffusion on the reservoir design, fluid selection (methanol), and predicted thermal performance; and the influence of axial conductiviy on radiator design. Also presented is the flight qualification and acceptance testing program which caused no significant change in AHPE performance. The results of thermal performance tests conducted under simulated flight conditions are discussed to demonstrate that the predicted and actual thermal performance compare favorably. Although ultimate confidence must await flight proven performance, it is concluded that the behavior of gas-controlled heat pipes appear well enough understood, and that sufficient analytical design tools are available, to begin utilizing this technology effectively in spacecraft thermal control applications. 9 refs.

ID NO.- EI730205808 305808
VORTRAEGE, II. KRAFTFAHRZEUG- UND MOTORTECHNISCHE KONFERENZ $left bracket$ PROCEEDINGS, 2ND CONFERENCE ON MOTOR VEHICLES AND MOTOR ENGINEERING $right bracket$.
Conf
Proceedings, 2nd Conference on Motor Vehicles and Motor Engineering, 3 Parts, Sopron, Hung, by Scientific Society of Mechanical Engineers (Gepipar i Tudomanyos Egyesulet) Prockl Laszlo, Budapest, Hung, 1971, various pagings
DESCRIPTORS: *AUTOMOBILES, AUTOMOBILE ENGINES, INTERNAL COMBUSTION ENGINES, MOTOR TRUCKS, MOTOR BUSES, AUTOMOBILE MANUFACTURE,
CARD ALERT: 661, 662, 663
Proceedings includes 60 papers concerning various new advances in the field of automobile and commercial motor vehicle engineering. Covered are several specific topics such as: application of high pressure in commercial vehicles; determination of specific performance of such vehicles: holographic, photoelastic, and acoustic examination of motor vehicles; determination of stresses occurring during motor vehicle operation; effects of side wind on motor vehicles: new methods of noise and vibration assessment in these vehicles; injuries from glass; traffic safety; development of motor vehicle radiators, selection of roller bearings for gears; calculation of bus axle loads, and determination of crankshaft elastic parameters; combustion engine crankshafts and optimization of their cooling; design of high-speed combustion engines; corrosion protection of combustion engines; interrelationships between injection, combustion, and thermal stress in these engines; brake pressure efficiency and control, and hydrodynamic braking; examination of pollutants in exhaust gases and possibilities of their elimination; designing of great-capacity buses; application of fiber-reinforced composites for bus body design; and problems of bus body rigidity. In German.

ID NO.- EI721108941 286940
THERMAL CONTROL CONCEPT EVALUATION FOR A TEN-YEAR LIFE MODULAR SPACE STATION.
Arras, R. P.; Laubach, G. E.; Wright, J. P.
North American Rockwell, Downey, Calif
ASME Pap n 72-ENAv-30 for Meet Aug 14-16 1972, 14 p
DESCRIPTORS: (*SPACE VEHICLES, *Temperature Control), HEAT PIPES,
IDENTIFIERS: SPACE STATION
CARD ALERT: 641, 655
Alternative thermal control concepts were examined for application to the North American Rockwell/NASA-MSC Modular Space Station preliminary design. Concepts included those based on totally passive elements utilizing heat pipes, hybric concepts with pumped fluid internal heat transport loops coupled with a heat pipe radiator and totally active type concepts with fluid flowing both internally and externally to the vehicle pressure hull. Comparison criteria included weight, power, reliability, maintainability and flexibility with special emphasis given to the relative cost of each option.

ID NO.- EI71X167136 167136
Automatic control of thermal regime of engines
SHIPILOV GV; TSURKAN IG
Vestn Mashinostr n 5 May 1970 p 30-2 CODEN: VMASA
DESCRIPTORS: (*INTERNAL COMBUSTION ENGINES, *Cooling), INTERVAL COMBUSTION, (ENGINES, Cooling), HYDRAULIC CONTROL AND TRANSMISSION,
CARD ALERT: 612, 632, 731, 732
It is shown that the cooling liquid temperature in automobile, tractor, locomotive, and marine internal combustion engines can be automatically controlled by using a variable- filling hydraulic coupling which intermittently switches off the radiator fan. The functional diagram and the algorithm scheme of the device are presented. Experimental investigation showed that the deviation of the cooling medium temperature from the optimum temperature (85 C) did not exceed 5 C; the warming- up time was reduced nearly threefold; the fuel consumption was reduced by 5%. In Russian.

ID NO.- EI70X040017 040017
Airlock environmental and temperature control systems
CALHOUN II LD
SAE-Paper 690623 for meeting Oct 6-10 1969, 15 p
DESCRIPTORS: (*SPACE VEHICLES, *Temperature Control),
CARD ALERT: 655
The airlock environmental control and temperature control systems for the Apollo Applications Satellites are described. The environmental control system will perform four functions, including pressurization of the airlock, multiple docking adaptor, and orbital workshop; it will further automatically control oxygen partial pressure, remove CO//2 with a regenerative subsystem, and provide cooling to astronauts wearing liquid cooled suits. The thermal control system features a bifillar radiator for flow stability with low pressure drops, a thermal capacitor that supplements radiator performance, electrical wall heaters, thermal curtains, and tailored thermal coatings.

ID NO.- EI70X023230 023230
Cooling of a high-power electron tube in a space vehicle
CONWAY EC; WILMARTH RW
General Electric Co, King of Prussia, Pa
IEEE-Conference Rec of 9th Conference on Tube Techniques, New York City, NY, Sept 17-18 1968 p 182-90
DESCRIPTORS: (*ELECTRON TUBES, *Traveling Wave),
CARD ALERT: 714
Thermal control system has been designed, built, and tested to provide cooling for a traveling wave tube (TWT) mounted in a spacecraft. The system was designed to demonstrate the capability of heat pipes to provide high thermal conductance paths for 750 w, dissipated at the TWT collector, to flow to a flat plate radiator where the heat can be radiated to space. Test results are included, showing the system thermal performance in several modes of operation for varying power dissipations. The results of failure of one, two, three, or all four pipes are presented. Also included is an analytical investigation of the weight and area requirements of both passive and heat pipe space radiators.

ID NO.- EI740208359 408359
SATELLITE NUCLEAR POWER STATION: AN OPTION FOR FUTURE POWER GENERATION
Williams, J. R.; Clement, J. D.
Ga Inst of Technol, Atlanta
Intersoc Energy Convers Eng Conf, 8th, Proc, Pap, Univ of Pa, Philadelphia, Aug 13-17 1973 p 566-573. Publ by AIAA, New York, 1973
DESCRIPTORS: *NUCLEAR POWER PLANTS, MAGNETOHYDRODYNAMIC CONVERTERS, SATELLITES,
IDENTIFIERS: SATELLITE NUCLEAR POWER PLANTS
CARD ALERT: 613, 615, 655
Description of the features of the Satellite Nuclear Power Station concept $EM DASH$ i. e. , an earth satellite remotely operated in synchronous orbit which would transmit power safely to the ground by a microwave beam. Fuel reprocessing would take place in space and no radioactive materials would ever be returned to earth. To provide 10,000 MWe to the earth, the system would weigh about 20 million pounds and cost less than $1000/KWe. An advanced breeder reactor operating with an MHD power cycle could achieve an efficiency of about 50% with a 1100 $degree$ K radiator temperature. If a hydrogen moderated gas core reactor is used its breeding ratio of 1. 10 would result in a fuel doubling time of a few years. A rotating fluidized bed or NERVA type reactor might also be used. The efficiency of power transmission from synchronous orbit would range from 70 to 80%. 22 refs.

ID NO.- EI730420876 320876
SPACE STATION ENVIRONMENTAL THERMAL CONTROL SYSTEM DEFINITION.
Cody, Joseph C.; Byke, R. M.; Stell, A. T.
NASA Marshall Space Flight Cent, Huntsville, Ala
Prog Astronaut Aeronaut, Fundam. of Spacecr Therm Des v 29, MIT Press, Cambridge, Mass, 1972 p 579-599
DESCRIPTORS: (*SPACE VEHICLES, *Life Support Systems),
CARD ALERT: 655
The methods used to select and define an environmental thermal control system (ETCS) for a 12-man space station are presented. The ETCS was defined to meet the space station program requirements and to require minimum resources for design, development, and qualification to support a 1977 launch. The design consits of an exterior radiator/fluid system with regenerative temperature control interfacing with an interior heat-transport water loop. The adequacy of the radiator design was verified by a parametric computer analysis that considered thermal coating degradation, vehicle attitude, docked module blockage, and variation in the solar constant, albedo, and earth emission. 3 refs.

ID NO.- EI721108941 286940
THERMAL CONTROL CONCEPT EVALUATION FOR A TEN-YEAR LIFE MODULAR SPACE STATION.
Arras, R. P.; Laubach, G. E.; Wright, J. P.
North American Rockwell, Downey, Calif
ASME Pap n 72-ENAv-30 for Meet Aug 14-16 1972, 14 p
DESCRIPTORS: (*SPACE VEHICLES, *Temperature Control), HEAT PIPES,
IDENTIFIERS: SPACE STATION
CARD ALERT: 641, 655
Alternative thermal control concepts were examined for application to the North American Rockwell/NASA-MSC Modular Space Station preliminary design. Concepts included those based on totally passive elements utilizing heat pipes, hybric concepts with pumped fluid internal heat transport loops coupled with a heat pipe radiator and totally active type concepts with fluid flowing both internally and externally to the vehicle pressure hull. Comparison criteria included weight, power, reliability, maintainability and flexibility with special emphasis given to the relative cost of each option.

ID NO.- EI721000602 278602
POTENTIAL OF NUCLEAR MHD ELECTRIC POWER SYSTEMS.
Seikel, George R., Nichols, Lester D.
NASA, Lewis Res Center, Cleveland, Ohio
J Spacecr Rockets v 9 n 5 May 1972 p 322-326 CODEN: JSCRAG
DESCRIPTORS: (*POWER GENERATION, *Magnetohydrodynamic), NUCLEAR REACTORS,
CARD ALERT: 615, 621
MHD generators are uniquely capable of fully exploiting advances in the high-temperature reactor technology for electric power generation. Extension of NERVA technology could make 2500$degree$K long-life, inert, gas-cooled reactors feasible. Such reactors and MHD generators mate into attractive multi-Mw electric power systems for either space or ground applications. A turbo-MHD system using a turbine driven compressor is the most attractive cycle. It has high-cycle efficiency and low-radiator area and temperature for space applications. A space-power system with 10 Mw electric output, shielded for manned missions, could achieve specific masses of 3. 5 to 5 kg/kw//e. A ground power station with 60% efficiency also appears feasible. 14 refs.

ID NO.- EI71X161914 161914
High power linear beam tube devices
GUENARD P
Laboratoire Electronique et Corpusculaire, Orsay, France
J. Microwave Power v 5 n 4 Dec 1970 p 261-7
DESCRIPTORS: (*POWER GENERATION, *Microwave), (ELECTRON TUBES, Klystron),
IDENTIFIERS: SATELLITE POWER STATIONS
CARD ALERT: 714, 715

The suitability of the klystro as a microwave power generator in space power station applications is discussed. The importance of reducing overall weight and of operating the collector at as high a temperature as possible is noted. This could be done with klystrons, where the heat dissipating electrode is well separated from the gun and the microwave structure. This high temperature operation of the heat radiators, together with a new technology based on an open structure and the extensive use of heat pipes should put the klystron in a good competitive position.

ID NO.- EI770535798 735798
ORGANIC RANKINE CYCLE ENGINE DEVELOPMENT AND SOLAR ENERGY UTILIZATION.
Ichikawa, S.; Watanabe, M.
IHI, Tokyo, Jpn
Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6 1975 Publ by Dev Anal Assoc, Cambridge, Mass, 1976 v 1 p 739-752
DESCRIPTORS: (*SOLAR POWER PLANTS, *Energy Utilization), (ELECTRIC POWER GENERATION, Solar Energy), (SOLAR RADIATION, Collectors),
CARD ALERT: 615, 901, 657
The Solar-Heat Actuated Organic Rankine-Cycle Engine is one of the most advantageous means of utilizing solar heat, because it is compact and reliable. A 490 kW packaged unit, recently commercialized, and a standardized series of 25 kW and 50 kW packaged units could be applied to a large variety of power requirements, such as electrical generation, water pumping, air-conditioning and refrigeration.

ID NO.- EI770535754 735754
WATER PUMPING $EM DASH$ A PRACTICAL APPLICATION OF SOLAR ENERGY.
Fiatte, F.; Clemot, M.
Cie Fr des Pet, Paris
Heliotech and Dev, Proc of the Int Conf, Dhahran, Saudi Arabia, Nov 2-6 1975 Publ by Dev Anal Assoc, Cambridge, Mass, 1976 v 2 p 331-339
DESCRIPTORS: (*SOLAR ENERGY, *Applications), (IRRIGATION, Pumping Systems), (SOLAR RADIATION, Collectors),
CARD ALERT: 615, 657, 821
Solar pumping installations of 1 kW and 25 kW are described. These stations are integrated with buildings which can be used to house a school, a market or a dispensary.

ID NO.- EI770319393 719393
SEP SOLAR ARRAY TECHNOLOGY DEVELOPMENT.
Elms, R. V. Jr.; Young, L. E.
Lockheed Missiles & Space Co, Sunnyvale, Calif
Intersoc Energy Convers Eng Conf, 11th, Proc, State Line, Nev, Sep 12-17 1976 Publ by AIChE, New York, NY, 1976 v 2 SAE Pap 769236 p 1372-1378
DESCRIPTORS: (*PROPULSION, *Electric Energy), (SOLAR CELLS, Arrays), (SOLAR ENERGY, Applications), (SPACECRAFT, Power Supply),
CARD ALERT. 701, 615, 675, 655, 702
A technology development program is in progress to define a detail design of a lightweight 25 KW solar array from Solar Electric Propulsion (SEP) and to demonstrate technology readiness for fabrication, testing and flight of the large area solar array system. The requirements and baseline design for the 66 W/kg are discussed. The requirement for operation at 0. 3 tp 3. 0 A. U. heliocentric distance presents a wide range of temperature environments as well as severe combined thermal/vacuum/UV radiation environments. The specific technology deficient area are defined and the technology development program is presented. The program includes design and design evaluation testing on a component level followed by the fabrication and test of a developmental full-scale solar array wing, 13. 5 ft. $multiplied by$ 105 ft. in size. The results of the design studies and test program underway are presented. The test program covers the areas of (1) fabrication testing, (2) design support evaluation testing. (3) zero-gravity array fold-up testing, (4) full-scale array wing testing, and (5) NDT development testing. 1 ref.

ID NO.- EI761178177 678177
MODERNE FERNSEHSENDER FUER DEN VHF- UND UHF-BEREICH. $left bracket$ Modern TV Transmitters for VHF and UHF Regions $right bracket$.
Simond-Cote, Paul; Fuchs, Herbert
NTZ Nachr Z NTZ Commun J v 29 n 1 Jan 1976 p 42-45 CODEN: NNNCAZ
DESCRIPTORS: *TELEVISION TRANSMITTERS,
CARD ALERT: 716
TV transmitters with output powers ranging from 2 kw up to 25 kw for VHF and more specially, UHF are described. Emphasis is on new design and on the arguments for and against the use of tetrodes and klystrons as well as on the controversy as to whether the amplifiers for image and sound should be separate or combined. Electrical and mechanical construction of the transmitters are dealt with. 1 ref. In German.

ID NO - EI761177010 677010
INVESTIGATION OF GENERATION OF RESONANCE RADIATION BY STIMULATED RAMAN SCATTERING IN GASES.
Butylkin, V. S.; Kozyarskii, D. Yu.; Plyusnina, E. N.; Fisher, P. S.; Khronopulo, Yu. G.
Inst of Radio Eng and Electron, Acad of Sci of the USSR, Moscow
Sov J Quantum Electron v 5 n 10 Oct 1975 p 1242-1248
CODEN: SJQEAF
DESCRIPTORS: *RAMAN SCATTERING, LASERS, GAS, HYDROGEN,
CARD ALERT: 741, 744
A theoretical and experimental study was made of the generation of resonance radiation by stimulated Raman scattering in gases. Maximum values of the resonance field were found allowing for the reaction of the Stokes radiation on the pump wave and the conditions were formulated under which this could be achieved. Pulse radiation of about 25 kW/cm**2 intensity and $lambda$ $equals$ 2. 41 mu wavelength was generated in hydrogen; this intensity was close to the theoretical limit. The experimentally determined dependences of the efficiency of the resonance field generation on the energy and wavelength of the pump radiation, gas pressure, and intensity of a static electric field were in satisfactory agreement with the calculations 17 refs.

ID NO.- EI760960921 660921
HIGH POWER, WIDELY TUNABLE INFRARED SOURCE BASED ON STIMULATED ELECTRONIC RAMAN SCATTERING IN CAESIUM VAPOUR.
Cotter, D.; Hanna,D. C.; Wyatt, R.
Univ of Southampton, Engl
Opt Commun v 16 n 2 Feb 1976 p 256-258 CODEN: OPCOB8
DESCRIPTORS: (*LASERS, CHEMICAL, *Optical Pumping),
CARD ALERT: 744
A considerable increase in infrared tuning rate is reported through the use of three Raman transitions in caesium vapor and using dye lasers pumped by the second harmonic of a high power ruby laser. In this way stimulated electronic Raman scattering (SERS) was tuned over the ranges 2. 5-4. 75 mu m, 5. 67-8. 65 mu m and 11. 7-15 mu m, with infrared powers up to 25 kw. Several observations inconsistent with theoretical calculations are discussed. 9 refs.

ID NO.- EI760853652 653652
CONTINUOUS SYSTEM FOR THE DRYING OF LUMBER WITH MICROWAVE ENERGY.
Barnes, Derek; Admiraal, Lambertus; Pike, Robert L; Mathur, Vishwa N. P.
MacMillan Bloedel Res Ltd, Vancouver, BC
For Prod J v 26 n 5 May 1976 p 31-42 CODEN: FPJOAB
DESCRIPTORS: (*LUMBER, *Drying), WOOD PRODUCTS, CONVEYORS,
CARD ALERT: 692, 811
A prototype lumber-drying system utilizing microwave energy has been developed. Large pieces of hemlock and Douglas-fir Clear lumber, 2 in by 8 in by 10 ft have been dried in from 5 to 10 hrs with a low level of degrade and an even moisture content. The equipment consists of a 25-kW microwave generating and waveguide applicator system, located in the center of a 120-foot-long reciprocating conveyor. The whole system is maintained at the temperature and humidity required to minimize degrade and maximize energy utilization for the species being dried. 32 refs.

ID NO.- EI760213138 613138
SEPS SOLAR ARRAY DESIGN AND TECHNOLOGY EVALUATION.
Elms, R. V. Jr.; Young, L. E.
Lockheed Missiles & Space Co, Sunnyvale, Calif
Intersoc Energy Convers Eng Conf, 10th, Rec, Univ of Del, Newark, Aug 18-22 1975 Pap 759156 p 1041-1047. Publ by IEEE (Cat n 75CHO 983-7 TAB), New York, NY, 1975
DESCRIPTORS. (*SOLAR CELLS, *Arrays),
CARD ALERT: 762
A program to perform preliminary design for the purpose of identifying and evaluating the technology for a 25 kw solar array system with a power to weight ratio of 65 watts/kg. is discussed. The solar array system is composed of two wings. Each wing consists of a solar array blanket, a blanket launch storage container, an extension/retraction mast assembly, a blanket tensioning system, an array electrical harness, a necessary brackets and attach points for supporting the solar array system for launch and in the operating position. 1 ref.

ID NO.- EI760212281 612281
INEXPENSIVE SOLAR POWER DRIVES WATER PUMPING PLANT.
Anon
Eng News Rec v 195 n 16 Oct 16 1975 p 44 CODEN: ENREAU
DESCRIPTORS: (*PUMPING PLANTS, *Costs), SOLAR ENERGY.
IDENTIFIERS: WATER PUMPING PLANTS
CARD ALERT. 402, 446, 615, 657, 911
Based on a new, patented French solar turbine, the system, under construction at San Luis de la Paz, in Guanajuato state north of Mexico City, will pump 330,250 gal of fresh water daily, working only seven hours each day at its 25-kw capacity. The 25-kw unit costs $400,000. Amortized over 50 years, the final cost estimate ranges from about one to three cents per cu ft of water pumped.

ID NO.- EI750958347 558347
CHARACTERISTICS OF THE CARB TEK MOLTEN SALT BATTERY.
Schaefer, James C.
ESB Technol Cent
SAE Prepr n 750148 for Meet Feb 24-28 1975, 4 p CODEN: SEPPA8
DESCRIPTORS: *ELECTRIC BATTERIES, SECONDARY, ELECTROLYTES,
CARD ALERT: 702, 803, 804
A pilot line facility is in operation to evaluate the engineering and economic aspects of the Carb Tek molten salt cells and batteries. Presently, cells are meeting the design objective of 5 Wh/in**3 (0. 3 Wh/cc) of cathode, corresponding to about 28 Wh/lb (61. 9 Wh/kg) of cell. These cells and batteries are being designed for fork-lift truck applications. Design parameters for a 25 kW $multiplied by (times)$ h battery are: 720 A $multiplied by (times)$ h at a 6 h rate, producing in excess of 3000 Wh/ft**3 (106,000 Wh/m**3) at voltages of 30-36 V, and an energy density of about 30 Wh/lb (66. 3 Wh/kg).

ID NO.- EI750319103 519103
ANALYSIS OF A STATIONARY PNEUMATIC WAVE-ENERGY CONVERTER.
McCormick, Michael E.
US Nav Acad, Annapolis, Md
ASME Pap n 74-WA/Oct-2 for Meet Nov 17-22 1974, 5 p CODEN: ASMSA4
DESCRIPTORS: (*POWER GENERATION, *Seawater), WATER WAVES, MATHEMATICAL MODELS,
IDENTIFIERS: WAVE-ENERGY CONVERTER
CARD ALERT: 615, 631, 921
A theoretical analysis of a stationary pneumatic wave-energy conversion device is presented. Results obtained from the analysis show that the power converted is proportional to the cube of the wave height, producing a maximum time-averaged power per wave period of 25 kw for a 20-ft (6. 096 m) diameter unit located in a 3-ft (0. 9144 m) sea. The device can be adjusted for purposes of efficiency in any sea spectrum by simply changing the draft (length of the centerpipe) of the unit. The peak power output of the device occurs at a period similar to the resonant period of a surge chamber. 6 refs.

ID NO.- EI741279098 479098
THERMAL DESIGN OF FERRITE ISOLATORS FOR INDUSTRIAL MICROWAVE EQUIPMENT.
Leppin, J.
Tech Univ Clausthal, Clausthal-Zellerfeld, Ger
J Microwave Power v 9 n 3 Sep 1974 p 251-261 CODEN: JLMPAB
DESCRIPTORS: (*MICROWAVE ISOLATORS, *Ferrite Applications), ELECTRON TUBES, MAGNETRON,
CARD ALERT: 714
Ferrite isolators used to protect magnetrons in industrial microwave equipment may be simpler in design than those for communication applications since reverse attenuation and bandwidth requirements are moderate. On the other hand, high average power and large load reflection call for careful design of cooling parameters. A method is given which yields a constant surface temperature along the ferrite body by means of special tapering of ferrite slab height. This results in minimum isolator length. By proper choice of ferrite material (e. g. yttrium-iron garnet) and careful construction, average power handling of 25 kw at 915 MHz is possible.

ID NO - EI741168942 468942
DATA ACQUISITION FOR A REMOTE SENSING FIELD MEASUREMENT PROGRAM.
Harlan, J. C.; Morgan, C. A.; Newton, R. W.
Lockheed Electron Corp, Houston, Tex
Natl Telecommun Conf, Conf Rec, Pap, Atlanta, Ga, Nov 26-28 1973 v 1, Pap 9B, 8 p. Available from IEEE (73 CHO 805-2NTC). New York, 1973 CODEN: NTCCAM
DESCRIPTORS: (*DATA PROCESSING, *Data Acquisition), SPECTROMETERS, INFRARED, RADIOMETERS,
CARD ALERT: 723, 941, 944
The NASA field data acquisition system to be discussed in this paper is a self-contained, ground-based, mobile system designed and used for remote sensing applications research. The system consists of: (1) two main sensors (the visible-infrared interferometer spectrometer and the X- and L-band microwave radiometer); (2) their electronics and computerized data systems; (3) a data van from which the sensors are operated, (4) a flat bed truck with a 75 foot articulated arm serving as the sensor platform; and (5) a 25 KW electrical power generator. This paper is devoted to a general discussion of the field system, its unique features and the measurement program in which it is used. 1 ref.

ID NO.- EI741065105 465105
MAGNETIC-THYRISTOR GENERATOR PRODUCING HIGH-VOLTAGE NANOSECOND PULSES.
Vorob'ev, A. N.; Bogdanov, V. M.; Gerchikov, F. L.; Guk, V. G.; Ushakov, A. A.
Leningrad Polytech Inst, USSR
Instrum Exp Tech v 17 n 1 Part 1 Jan-Feb 1974 p 110-111 CODEN: INETAK
DESCRIPTORS: *PULSE GENERATORS,
CARD ALERT: 715
A compact generator which produces powerful nanosecond pulses is described. The length of the pulses across the load of 200 to 300 $OMEGA$ is 9 to 12 nsec for a duration of the leading edge equal to 4 to 5 nsec. The repetition frequency of the pulses is up to 1. 0 kHz, the power in the pulse is $less than equivalent to$ 25 kw; the amplitude of the pulse is $less than equivalent to$ 2. 5 kv. The generator weight is 120 g. 2 refs.

ID NO.- EI741059836 459836
KGE-2. 5 ELECTRON ACCELERATOR.
Kuritsina, I. V.; Lagutin, V. A.; Lyslv, A. V.; Nikonov, O. F.; Ovchinnikov, O. B
Sov At Energy v 35 n 6 Dec 1973 p 1172-1174 CODEN: SATEAZ
DESCRIPTORS: *ACCELERATORS,
CARD ALERT: 932
The KGE-2. 5 direct-acting acceleration was designed for use in industrial radiation processes featuring a beam power of 25 kW, maximum electron energy 2. 5 MeV, energy control limits 0. 5-2. 5 Mev, energy stability better than 1% and maximum electron beam current 10mA. 2 refs.

ID NO.- EI740632958 432958
HARMONIC ANALYSIS OF A SYNCHRONIZED PULSE-WIDTH-MODULATED THREE-PHASE INVERTER.
Dewan, Shashi B.; Forsythe, James B.
Univ of Toronto, Ont
IEEE Trans Ind Appl v IA-10 n 1 Jan-Feb 1974 p 117-122 CODEN: ITIACR
DESCRIPTORS: *ELECTRIC INVERTERS,
CARD ALERT: 703
In pulsewidth-modulated inverters used for variable-frequency applications, a number of harmonic control policies can be used. Most of these policies are complex to implement by hardware. The most simple and yet effective technique is synchronizing or the synchronized harmonic control policy. This paper uses double Fourier analysis techniques to obtain the output harmonics as a function of pulsewidth, pulsing frequency, and output frequency. The method obtains the harmonics as analytical functions and thus provides the necessary relationships for control studies and system optimization. The more significant theoretical results are provided and theoretical and experimental results obtainec from a 25-kw three-phase pulsewidth-modulated inverter, are compared.

ID NO.- EI730629184 329184
INVERTER FOR INDUCTION MELTING FURNACES.
Jhaveri, S. H.
Jyoti Ltd, Baroda, India
J Inst Eng (India), Electron Telecommun Eng Div v 53 Part ET 2 Nov 1972 p 55-58 CODEN: JEPEAC
DESCRIPTORS: (*FURNACES, MELTING, *Power Supply), ELECTRIC INVERTERS, (THYRISTORS, Applications), ELECTRIC HEATING, INDUCTION,
IDENTIFIERS: INDUCTION FURNACES
CARD ALERT: 532, 534, 703, 714
With the development of high power thyristors, it has been possible to develop high power high frequency solid state inverters for induction melting furnaces. These furnaces neec single phase supply with frequencies ranging from 180 to 4000 Hz. The power ratings range from 10 to 500 kW or more. In the past, the high frequency power was obtained from motor generator sets. But these are now being replaced by static thyristor inverters, which feature such advantages as less maintenance, less noise, small space and weight, and higher efficiency. It enables easy control of frequency over a fairly wide range. The development of a 25 kw unit operation at 3000 Hz is reported.

ID NO.- EI730417904 317904
RESIDUAL GASES IN ELECTRON TUBES.
Comsa, G.; Choumoff, P. S.; Bernadet, H.; de Chernatony, L.; Singleton, J. H.; Barosi, A.; Biguenet, C.; Attia, E. A.; Beck, A. H. W.; Smith, J. K.; Friedel, R.; Meinel, F. K.; Tuck, R. A.; Mellor, D. J.; McGee, J. D.
Residual Gases in Electron Tubes, London and New York, Academic Press, 1972, Proc, 4th Int, Held in Florence, Italy, Apr 14-17, 1971, 399 p
DESCRIPTORS: *ELECTRON TUBES, ELECTRIC LAMPS,
CARD ALERT: 707, 714
Behaviour of Ions in a BAG Tube. By G. Comsa. High Pressure Ionization Gauge with Extended Low Limit of Measurement. By P. S. Choumoff and H. Bernadet. Perturbational Limitations to the Attainment of UHV. By L. de Chernatony. Gas Sources and Pumping Processes in Electronic Power Tubes. By J. H. Singleton. Gettering Activity of Some Single Phases Present in the Zr-Al Alloy System. By A. Barosi. Influence on Residual Atmosphere During Exhaust of Hydrocarbons Used in Mechanical Forepumps. By C. Biguenet. Exhaust Processing and Test Operation of a Vacuum Switch Tube. By E. A. Attia. Residual Gas Effects in a 25 kW Ceramic Envelope Klystron. By A. H. W. Beck and J. K. Smith. Thermionic Cathodes under the Bombardment of Ions. By R. Friedel and F. K. Meinel. Gas Poisoning of Osmium-Coated Tungsten Cathodes under Realistic Operating Conditions. By R. A. Tuck. Long-Term Stability of Corona Discharge Stabilizer Tubes. By D. J. Mellor. Vacuum Problems of Photoelectric Devices. By J D. McGee.

ID NO.- EI721214602 292601
EFFICIENT SECOND-HARMONIC AND SUM-FREQUENCY GENERATION FROM A FLASHLAMP-PUMPED DYE LASER.
Kuhl, J.; Spitschan, H.
Opt Commun v 5 n 5 Aug 1972 p 382-388 CODEN: OPCOB8
DESCRIPTORS: *LASERS, CHEMICAL, SPECTROSCOPY,
CARD ALERT: 741, 932
A tunable ultraviolet light source of high spectral brightness has been generated by frequency doubling of the emission of a flashlamp-pumped rhodamine 6G laser. Second harmonic generation (SHG) has been studied for different bandwidths of dye laser emission between 8 nm and $less than$ 10**-**3nm. By proper adjustment, the laser can achieve conversion efficiencies between 10% and 18% for output powers 15 to 25 kW. The influence of the spatial and spectral characteristics of the laser beam on the efficiency of SHG is discussed. 12 refs.

ID NO.- EI72X044786 244786
New xenon compact- arc projection lamps for horizontal operation
STRAUSS HS; THOURET WE; LEYDEN J; KEE H; HUNT TW
Duro-Test Corp, North Bergen, NJ
J SMPTE v 81 n 1 Jan 1972 p 33-8
DESCRIPTORS: (*MOTION PICTURES, *Light Sources), (ELECTRIC LAMPS, Arc),
CARD ALERT: 707, 742
Xenon compact arc lamps are used increasingly instead of carbon arcs in motion- picture theater projectors and studio- lighting equipment. Such lamps have to perform with great reliability and must operate in horizontal position in order to be economic and efficient in up- to- date optical systems. The properties of four new lamps types are described that meet these requirements. Three of these lamps are in the medium wattage range between 2000 and 4500 w and have conventional radiation- cooled electrodes. The fourth type can be operated reliably with inputs from 10 to 25 kw and has liquid- cooled electrodes. 21 refs.

ID NO.- EI72X018182 218182
Measurement of the rf magnetic field distribution in a thermal induction plasma
ECKERT HU
Aerospace Corp, El Segundo, Calif
J Appl Phys v 42 n 8 July 1971 p 3108-13 CODEN: JAPIA
DESCRIPTORS: *PLASMAS, (ELECTRIC DISCHARGE, Plasma), (MAGNETIC FIELDS, Measurements),
IDENTIFIERS: THERMAL INDUCTION PLASMA, MAGNETIC FIELD DISTRIBUTION
CARD ALERT: 701, 932
The radial distribution of the RF magnetic field in the equator section of a 25- kw argon induction flame maintained at 2. 6 MHz in a 155- mm- wide tube is measured with a 3- mm- diam water- cooled search coil. From the field distribution a variation in magnetic pressure over the plasma radius of 16 dyn/sq cm is calculated which is in order- of- magnitude agreement with values quoted in the literature. Probe errors caused by signal averaging, current obstruction, and plasma cooling are discussed and found to be of minor consequence.

ID NO.- EI71X036567 136567
Use of an accelerated wear machine to examine the skidding resistance of concrete surfaces
WELLER DE; MAYNARD DP
Gt Brit, Min Transp, Road Res Lab, RRL Rep LR 333, 1970, 40 p
DESCRIPTORS: (*ROADS AND STREETS, *Skid Resistance), (ROAD MATERIALS, Concrete), MATERIALS TESTING APPARATUS,
CARD ALERT: 406, 412, 421, 422
An accelerated wear machine was developed to simulate on specimens tested in the laboratory the type of wear observed on concrete road surfaces; this machine can be used to examine the relative effect of materials and mix design on the skid resistance value and on the retention of texture. The approximate size of specimen adopted was 150x90x40 mm and the specimens were cast in metal molds curved to suit the machine. The machine consists of a 815 mm diam wheel onto which 16 concrete specimens can be mounted. The wheel is chain driven from a 2. 25 kw electric motor at a speed at 150 rpm.

ID NO.- EI71X014439 114439
Experiments using a 25- kw hollow cathode lithium vapor MPD arcjet
FRADKIN DB; BLACKSTOCK AW; ROEHLING DJ; STRATTON TF; WILLIAMS M; LIEWER KW
Los Alamos Scientific Lab, NMex
AIAA J v 8 n 5 May 1970 p 886-94 CODEN: AIAJA
DESCRIPTORS: (*SPACE VEHICLES, *Electric Propulsion), (ACCELERATORS, Power Supply), (ROCKETS AND MISSILES, Propellants), LITHIUM,
CARD ALERT: 542, 654, 655, 932
The performance is reported of the arcjet which incorporates a unique feed system with an '%'open- ended heat- pipe%'%' vaporizer and a hollow cathode. The arc typically operates at currents of 250 to 500 amp, voltages of 40 to 60 v, magnetic field strengths between 500 and 3000 gauss, and produces a highly ionized lithium beam which transports 70% of the input electrical power to the beam stop. The ambient tank pressures range as low as 2x10- //7 torr. A comparison of hollow cathode and conventional MPD arc performance is made and it is concluded that the hollow cathode arc is superior to the conventional design. 17 refs.

ID NO.- EI70X031885 031885
Design considerations for an electric car
THORNTON RD
SAE-Paper 700020 for meeting Jan 12-16 1970, 6 p
DESCRIPTORS: (*AUTOMOBILES, *Electric),
CARD ALERT: 662
An electric spot- car is conceived and described. The car would have a gross unloaded weight of 3300 lb and be capable of driving a level 62 mi in 1 hr. Regenerative braking and a fossil- fueled alternator are included in the design sc as tc extend range. Power requirements of 25 kw hr restrict battery material choices to nickel- cadmium or lead- acid. Prcjectec cost of the car is quite high, 5000 to 5500 dollars, and even this figure is dependent upon a fairly sizable market. 2 refs.

ID NO.- EI70X005399 005399
Anomalous operation of d- c generators using recrifiers anc regulation
KALUGIN BN; AIZENSHTEIN BM; ALEKSEEV II
Elektrotekhnika n 5 May 1969 p 24-6
DESCRIPTORS: (*ELECTRIC GENERATORS, *Protection), (ELECTRIC MACHINERY, Direct Current),
CARD ALERT: 058, 241
High- speed protection system is proposed that respcnds tc sudden rectified voltage drop to zero, during short circuit in one of generator rectifier, and to voltage in rectifier terminals during faults in one of rectifier elements: suggestion is based on analysis of 3 to 25 kw and 28. 5 v generators. In Russian.

ID NO.- EI770643126 743126
ONE MW//t//h BENCH MODEL CAVITY RECEIVER STEAM GENERATOR.
Blake, F. A.; Tracey, T. R ; Walton, J. D.; Bomar, S.
Martin Marietta Aerosp, Denver, Colo
Sol Energy v 18 n 6 1976 p 513-523 CODEN: SRENA4
DESCRIPTORS: (*POWER GENERATION, *Solar Energy), SOLAR ENERGY, (SOLAR RADIATION, Collectors), ENERGY SOURCES,
IDENTIFIERS: STEAM GENERATORS, SOLAR POWER SYSTEMS
CARD ALERT: 615, 657, 901
Design of a bench model steam generator having geometric and thermal characteristics of the full-scale steam generator to be used in energy collection-conversion modules of a 100 MW//e solar energy conversion power plant scaled for operation in the Centre National de la Recherche Scientifique solar furnace at Odeillo, France, was a major element of the Solar Power System and Component Research Program. The planned follow-up program to fabricate the bench model steam generator, to provide required instrumentation-control-adaptation equipment and to perform checkout testing is being performed during 1975.

ID NO.- EI770208801 708801
SYSTEMS DESIGN ANALYSIS OF A SODIUM-SULFUR LOAD-LEVELING BATTERY INSTALLATION.
Gelb, G. H.; Sayano, R. R ; Kunz, G. E.; Silverman, H. P.
TRW Inc, Redondo Beach, Calif
Proc of the Symp on Energy Storage, 148th Meet of the Electrochem Soc, Dallas, Tex, Oct 5-9 1975 Publ by Electrochem Soc, Inc, Princeton, NJ, 1976 p 155-164
DESCRIPTORS: *ELECTRIC BATTERIES, SODIUM AND ALLOYS, SULFUR,
CARD ALERT: 702, 549, 804
The Battery Energy Storage Test (BEST) facility is planned by the Electric Power Research Institute as a full-scale plant for evaluating new load-leveling battery systems. An analysis was conducted of the cell, sub-module and module designs and battery installation in order to establish BEST facility requirements relevant to one form of a sodium-sulfur battery system. The battery system was sized to provide 10 MW hr of energy at 1 MW. Thermal and power analyses were used to establish the requirements for start-up, normal operation, shut-down, emergency shut-down, heating and cooling of the modules, instrumentation and control and safety.

ID NO.- EI751278946 578946
INEXPENSIVE ELECTROENCEPHALOGRAPHIC PROCESSOR FOR OPERATING ROOM AND INTENSIVE CARE USE.
Fleming, Robert A.; Smith, N. Ty
Univ of Calif, San Diego
San Diego Biomed Symp, Proc, San Diego, Calif, Feb 6-8 1974 p 187-192. Publ by San Diego Biomed Symp (v 13), Calif, 1974
DESCRIPTORS: (*BIOMEDICAL ENGINEERING, *Electroencephalography), DISPLAY DEVICES,
CARD ALERT: 461, 462, 722
The Density-modulated Spectral Array (DSA), a completely self-contained device capable of fitting into a standard thermal strip-chart plug-in module is described. It calculates the power spectrum of an EEG signal and displays it on the strip chart in a density-modulated format with variable line darkness and thickness. The result is similar to a voiceprint, and allows easy visualization of frequency changes, frequency spread, and intensity changes. It is a digital-analog hybrid device built using about 80 integrated circuits plus a number of discrete components. The parts cost is about $250. 00, although other necessities such as printed circuit boards, power supplies and packaging increase the cost to $400. 00. The unit includes automatic gain control for the input signal as well as an automatic gain adjust for the output. Various sampling times, frequency ranges, and amplitude ranges can be selected. The primary goal, however, was to produce a device requiring no adjustments other than initial setup. This way no data are lost because the physician is occupied and cannot adjust gain levels. 5 refs.

ID NO.- EI741066019 466019
INTERDEPENDENCE OF THE AIRLOCK MODULE/ORBITAL WORKSHOP THERMAL CONTROL AND ELECTRICAL POWER SYSTEMS ON SKYLAB.
Markus, J. A.
McDonnell Douglas Astronaut Co, East. St. Louis, Mo
ASME Pap n 74-ENAs-35 for Meet July 29-Aug 1 1974. 9 p
CODEN: ASMSA4
DESCRIPTORS: (*SPACE VEHICLES, *Power Supply), (SOLAR RADIATION, Collectors), (SOLAR CELLS, Arrays),
IDENTIFIERS: SKYLAB, AIRLOCK THERMAL CONTROL, ELECTRICAL POWER
CARD ALERT: 655, 657, 702
The basic Airlock Module/Orbital Workshop electrical power system consisted of solar arrays, rechargeable nickel cadmium batteries, battery chargers, and voltage regulators. Thermal control played a major role in performance of this system since power output of the solar arrays and batteries varies with their temperature. The solar array temperature control system was limited to a passive radiator surface on the backside of the array panels. Solar panels experience a large temperature variation as Skylab alternately passes through direct sunlight and earth shadow. An extensive test program of the nickel cadmi battery was accomplished to establish thermal/electrical performance of the components and system. Parametric data from battery testing were reduced to empirical battery performance equations. Extensive experience gained throughout development of the thermal/electrical system and computer simulations is reviewed in this paper. 3 refs.

ID NO.- EI740101515 401515
ELECTRONIC COMPONENTS CONFERENCE, PROCEEDINGS, 1973.
Kersey, R.; Ihochi, T.; Loughran, James; Kurzweil, Karel; Hindermann, D. K.; Brady, T. E.; Schappacher, J. B.; Baxter, Gene K ; Wilson, E. A.; Boucher, S. G.; Paradis, L R.; Christian, David B.; Peoples, Ronald K.; Evans, Ralph A.; Fahley, Warren A
Electron Components Conf, 23rd, Proc, Washington, DC, May 14-16 1973 Available from IEEE, New York, 1973, 363 p
DESCRIPTORS: *ELECTRON DEVICE MANUFACTURE, INTEGRATED CIRCUITS, HYBRID, (SEMICONDUCTOR DEVICES, Temperature Effect), (INTEGRATED CIRCUITS, Reliability),
IDENTIFIERS: MULTILAYER HYBRID INTEGRATED CIRCUITS
CARD ALERT: 713, 714
Following is a continuation of the list of titles and authors: Fabrication of Multilayer Structures Using Various Film TEchnologies. By R. Kersey. Screened Multilayer Ceramics for Thick Film Hybrids. By T Ihochi. Thick Film Pastes for Multilayer Use. By James Loughran and Karel Kurzweil. Bi-Level Thin Film Hybrid Integrated Circuit Containing Crossovers, Resistors and Capacitors. By D. K. Hindermann and T. E. Brady. C-Band Low Noise Amplifier. By J. B. Schappacher. Transient Temperature Response of Semiconductor Devices Under Pulse Power Operations. By Gene K. Baxter. Thermal Analysis of Integrated Circuit Packaging Techniques By E. A. Wilson. Experimental Heat Transfer Investigations on Modules Mounting Hybrid Packages. By S. G. Boucher and L. R. Paradis. New Relationships Between Stress Testing, Failure and Reliability. By David B. Christian. Failure Analysis Used to Vindicate JANTX Components. By Ronald K. Peoples. Quality Control and Buying Integrated Circuits. By Ralph A. Evans. Detection of Random Chip Defects in Monolithic Microcircuits. By Warren A. Fahley.

ID NO.- EI730526259 326259
FUTURE ORBITAL OBSERVATORY MODULES FOR STELLAR AND GALACTIC ASTRONOMY.
Kober, Carl L.
Martin Marietta Corp, Denver, Colo
Adv Astronaut Sci, Suppl, Sci Technol Ser v 28, 1972, p 115-132
DESCRIPTORS: (*SPACE VEHICLES, *Observatories), TELESCOPES,
CARD ALERT: 655, 741
Extensive design studies have been conducted for orbital observatory modules awaiting heavy payload capabilities such as the Shuttle and later on the Space Station. These studies center around a three-meter diffraction-limited telescope, with a broad band coverage in the UV and visible region. Very stringent pointing and stability requirements of 0. 005 arc sec and coverage from 900 A to 10 microns are design goals for the next 10 years. Companion instruments in the short UV and X-Ray regions and extensions into the very long IR have to be accommodated. The selection of orbit and orbit maneuvers lead to design requirements, which break down into structures, data management and communication, propulsion, thermal control, atmosphere control and contamination, electric power, guidance and control, an onboard checkout system, control and display for manned periodic access, and stability sensitivity for long term exposures of faint stellar objects. Basic technical feasibility can be shown although a long term and hopefully uninterrupted development program is necessary to achieve these goals.

ID NO.- EI72X047376 247376
Thermal control of densely packaged microelectronics in dielectric fluids
MEGERLIN FE; VINGERHOET P
Raytheon Missile Systems Div, Bedford, Mass
IEEE, NAECON '71, Proc Nat Aerospace Electron Conf, Dayton, Ohio, May 17-19 1971 p 254-9
DESCRIPTORS: *INTEGRATED CIRCUITS, (RADIO EQUIPMENT, Cooling),
CARD ALERT: 713, 714
The results of the experimental program described in this paper indicate that immersion cooling of microelectronic modules is a very effective method to obtain reliable operation of high density, high power LSI chips.

ID NO.- EI72X024650 224650
Spray modules cool plant discharge water
FROHWERK PA
Power v 115 n 9 Sept 1971 p 52-3 CODEN: POWEA
DESCRIPTORS: (*WATER POLLUTION, *Waste Heat Effects).
IDENTIFIERS: WASTE HEAT CONTROL, THERMAL POLLUTION
CARD ALERT: 453
The problem of taking cooling waters into a plant and discharging it into streams and lakes at some elevated temperature is considered. The Virginia Electric Power Company has attempted to solve this problem by installing floating '%'spargers'%' in the station's discharge channel.

ID NO.- EI70X147281 047281
Lunar module thermal- vacuum simulation utilizing conformal heater thermal control
HELLMANN R; CONOVER M; MORRISON E; NEILSON G
Grumman Corp, Houston, Tex
J Spacecraft Rockets v 7 n 2 Feb 1970 p 126-31
DESCRIPTORS: (*SATELLITES, *Heat Problems), (SOLAR RADIATION , Analogies),
CARD ALERT: 655, 657
A Lunar Module Test Vehicle (LTA- 8) was placed in a vacuum chamber and subjected to manned thermal- vacuum tests to qualify the LM design for an earth orbital mission. Solar radiation was simulated by the use of conformal skin heaters controlled to predicted heating rates. The heaters consisted of resistance ribbon attached to the skins and controlled by individual power modules. Nearly 2000 measurements were utilized to monitor the vehicle structure, subsystems, heaters,acuum chamber, and astronaut physiological condition. Comprehensive data retrieval and display systems insured successful monitoring and control of the test operation. 7 refs

ID NO.- EI70X001915 001915
TRANSICONT S protective system for thermal power stations
LEZENIK B; RAMSAUER H
Siemens Rev v 36 n 5 May 1969 p 177-84
DESCRIPTORS: (*STEAM POWER PLANTS, *Control), (STEAM TURBINES, Protection), BOILERS, (PUMPS, Feedwater),
CARD ALERT: 053, 197
System described can be arranged to suit conditions prevailing in every power station, and developed with view to increasing operational reliability and availability of individual generating sets; system permits flexible combination of various modules; regular function tests and redundant circuits ensure positive and reliable fault detection; three typical fields of application are described including turbine, feedpump and boiler protection.

ID NO.- EI741066019 466019
INTERDEPENDENCE OF THE AIRLOCK MODULE/ORBITAL WORKSHOP THERMAL CONTROL AND ELECTRICAL POWER SYSTEMS ON SKYLAB.
Markus, J. A.
McDonnell Douglas Astronaut Co, East, St. Louis, Mo
ASME Pap n 74-ENAs-35 for Meet July 29-Aug 1 1974, 9 p
CODEN: ASMSA4
DESCRIPTORS: (*SPACE VEHICLES, *Power Supply), (SOLAR RADIATION, Collectors), (SOLAR CELLS, Arrays),
IDENTIFIERS: SKYLAB, AIRLOCK THERMAL CONTROL, ELECTRICAL POWER
CARD ALERT: 655, 657, 702
The basic Airlock Module/Orbital Workshop electrical power system consisted of solar arrays, rechargeable nickel cadmium batteries, battery chargers, and voltage regulators. Thermal control played a major role in performance of this system since power output of the solar arrays and batteries varies with their temperature. The solar array temperature control system was limited to a passive radiator surface on the backside of the array panels. Solar panels experience a large temperature variation as Skylab alternately passes through direct sunlight and earth shadow. An extensive test program of the nickel cadmi battery was accomplished to establish thermal/electrical performance of the components and system. Parametric data from battery testing were reduced to empirical battery performance equations. Extensive experience gained throughout development of the thermal/electrical system and computer simulations is reviewed in this paper. 3 refs.

Set	Items	Description
1	328	SERIAL# UEG
2	214	SERIAL# UEI
3	936	RADIATOR?
4	0	1*2
5	0	1*3
6	46	SERIAL# UEJ
7	3	25(W)KW
8	1	(1OR3)AND2

Print 7/5/1-3
Print 8/5/1

Search Time: 0.115 Prints: 4 Descs.: 15

921430 A7651492, B7625111
FAST-DISCHARGE-INITIATED XEF LASER
WANG, C.P.; MIRELS, H.; SUTTON, D.G.; SUCHARD, S.N.
AEROSPACE CORP., EL SEGUNDO, CA, USA
APPL. PHYS. LETT. (USA) VOL.28, NO.6 326-8 15 MARCH 1976 Coden: APPLAB
EFFICIENT AND INTENSE LASER EMISSION FROM XEF AT 351, 353 AND 349 NM IS REPORTED. THE EMISSION IS INITIATED BY A FAST DISCHARGE IN A HE'XE' NF/SUB 3/ (100'3'1) MIXTURE AT LOW PRESSURES (200-400 TORR). THE EFFICIENCY OF CONVERSION OF ELECTRICAL ENERGY TO LASER ENERGY IS 1.2PERCENT AND PEAK POWERS OF 25 KW IN 40 NSEC PULSES ARE OBTAINED. THE PERFORMANCE IS ANALYZED IN TERMS OF A SIMPLE MODEL (7 Refs)
Descriptors: CHEMICAL LASERS; XENON COMPOUNDS
Identifiers: FAST DISCHARGE INITIATED XEF LASER; LOW PRESSURES; 25 KW PEAK POWER; 40 NSEC PULSE; 1.2PERCENT CONVERSION EFFICIENCY; HE-XE-NF/SUB 3/ MIXTURE
02
Section Class Codes: A2632, B2932
Unified Class Codes: EGECAH

880118 A7624813, B7613432
A HIGH POWER, WIDELY TUNABLE INFRARED SOURCE BASED ON STIMULATED ELECTRONIC RAMAN SCATTERING IN CAESIUM VAPOUR
COTTER, D.; HANNA, D C.; WYATT, R.
DEPT. OF ELECTRONICS, UNIV. OF SOUTHAMPTON, SOUTHAMPTON, ENGLAND
OPT. COMMUN. (NETHERLANDS) VOL.16, NO.2 256-8 FEB. 1976 Coden: OPCOB8
DYE LASERS PUMPED BY THE SECOND HARMONIC OF A RUBY LASER HAVE BEEN USED TO PRODUCE TUNABLE STIMULATED ELECTRONIC RAMAN SCATTERING IN CAESIUM VAPOUR. USING THREE DIFFERENT RAMAN TRANSITIONS, THE INFRARED TUNING RANGES WERE 2.5-4.75 MUM, 5.67-8.65 MUM AND 11.7-15 MUM WITH POWERS OF UP TO 25 KW, 7 KW AND 2 KW RESPECTIVELY (9 Refs)
Descriptors: NONLINEAR OPTICS; RAMAN SPECTRA OF INORGANIC SUBSTANCES; INFRARED SOURCES; CAESIUM
Identifiers: STIMULATED ELECTRONIC RAMAN SCATTERING; UP TO 25 KW; HIGH POWER WIDELY TUNABLE IR SOURCE, CS VAPOUR; DYE LASER PUMPING; 2.5 TO 4.75 MICRONS; 5.67 TO 8.65 MICRONS; 11.7 TO 15 MICRONS
02
Section Class Codes: A2660, B2960
Unified Class Codes EGKAET

607612 A7416323
DIFFUSION IN ELECTRON CYCLOTRON RESONANCE HEATING MAGNETIC MIRRORS
LICHTENBERG, A.J.; MELIN, G.
CEN, GRENOBLE, FRANCE
PHYS. FLUIDS (USA) VOL.16, NO.10 1660-7 OCT. 1973
Coden. PFLDAS
IN A THEORETICAL AND EXPERIMENTAL STUDY, THE HEATING MECHANISM WAS INVESTIGATED. LOSS CONE DIFFUSION WAS STUDIED THEORETICALLY (FOLLOWING EARLIER WORK' LIEBERMAN. LICHTENBERG SEE ABSTR. A17637 OF 1973) AND WAS FOUND TO BE GREATLY ENHANCED OVER COLLISIONAL RATES IN THE PRESENCE OF ELECTRON CYCLOTRON RESONANCE HEATING. BELOW THE ADIABATIC ENERGY BARRIER THE LOSS RATE WAS MUCH SMALLER THAN THE STOCHASTIC HEATING RATE. COMPUTED RESULTS WERE COMPARED WITH A 25 KW EXPERIMENT (16 Refs)
Descriptors: PLASMA HEATING; CYCLOTRON RESONANCE; MAGNETIC MIRRORS
Identifiers: ELECTRON CYCLOTRON RESONANCE HEATING; MAGNETIC MIRRORS; LOSS CONE DIFFUSION; COLLISIONAL RATES; ADIABATIC ENERGY BARRIER; STOCHASTIC HEATING RATE; 25 KW EXPERIMENT
02
Section Class Codes: A6550, A6560
Unified Class Codes: LGMAET, LGNAGF

334478 A7202010, C7201027
A CONTROL AND DATA-HANDLING SYSTEM FOR A LARGE STEERABLE AERIAL
QUIGLEY, M.J.S.
RADIO AND SPACE RES. STATION, SLOUGH, ENGLAND
KJELAAS, A.G.;
NATO, ADVANCED STUDY INST
SBN 082 512 0010 5
STATISTICAL METHODS AND INSTRUMENTATION IN GEOPHYSICS
155-66 1971
15-22 APR 1971 SKEIKAMPEN, NORWAY
TEKNOLOGISK FORLAG OSLO, NORWAY.
Descriptors: ASTRONOMICAL INSTRUMENTS; ELECTROMAGNETIC WAVES/RADIATORS; COMMUNICATION APPLICATIONS OF CONTROL; DATA HANDLING
Identifiers: DATA HANDLING, CONTROL; LARGE STEERABLE AERIAL; DISH, TROPOSPHERIC RADIO PROPAGATION; RADIOMETEOROLOGY; IONOSPHERIC; ASTRONOMICAL RESEARCH; DIGITAL COMPUTER; AUTOMATICALLY
06
Section Class Codes. A2160, C7580, C8812

User1277 Date:11aug77 Time:14:48:29 File: 6

Set	Items	Description
1	0	THERMAL CONTROL SURFACE
2	0	THERMAL CONTROL SURFACES
3	0	1+2
4	20409	THERMAL
5	49435	CONTROL
6	26363	SURFACE?
7	166	4-6/*
8	48992	SPACE
9	4290	VACUUM
10	52353	8+9
11	69	7*10

Print 11/5/1-69

Search Time: 0.006 Prints: 69 Descs.: 0

D2185F2 AD-801 963/0ST NTIS Prices: PC$9.25/MF$3.00
Structural Design Concepts for Variable-Geometry Lifting Surfaces of Reentry Vehicles

Gordy, Nelson G.; Wright, Robert M. Jr; Price, M. A.
Space and Information Systems Div North American Aviation Inc Downey Calif
Fld: 22B, 20D, 13M d7712
Oct 66
296p
Rept No: SID-66-1388
Contract: AF 33(615)-2685
Project: AF-1368
Task: 136808
Monitor: AFFDL-TR-66-175
Distribution limitation now removed.

An investigation and theoretical analysis was conducted to determine structural design concepts for variable geometry lifting surfaces for improving low speed performance and maneuverability of re-entry vehicles. Various lifting surface concepts were considered for three representative vehicles. These vehicles were the M22-f, SORTIE, and SID-1. The lifting surface concepts considered for these vehicles were evaluated and based on aerothermal and structural considerations, the concept most applicable to each vehicle was selected for further analysis and design. As a result of the detailed study of the three selected configurations, weight and volume penalties associated with the application of variable geometry to the re-entry vehicles were determined. (Author)

Descriptors: (.. ....&....0 .... *Boost glide vehicles, Structural properties.. ....&....0 ....), (.. ....&....-0 . ..... *Reentry vehicles, Design.. ....&....0 ....), Wing body configurations, Geometric forms, Lift, Structures, Theory, Aerodynamic configurations, Surface properties, Landing, Drag, Weight, Volume, Load distribution, Mathematical analysis, Thermodynamics, Gust loads, Fuselages, Wings, Aerodynamic loading, Aerodynamic control surfaces, Aeroelasticity, Thermal stresses, Maneuverability, Performance(Engineering)

Identifiers: Lift-drag ratio, NTISDODXD

D1913L3 AD-816 960/9ST NTIS Prices: PC$6.75/MF$3.00
Investigation of Nondestructive Methods for the Evaluation of Graphite Materials

Lockyer, G. E.; Shultz, A. W.; Serabian, S.; Carter, S. W.
Avco Missiles Space and Electronics Group Lowell Mass Avco Space Systems Div
Fld: 11B d7710
Jun 67
170p
Rept No: AVSSD-0228-67-CR
Contract: AF 33(615)-3942, AF 33(615)-1601
Monitor: AFML-TR-67-128
Distribution limitation now removed.

A program of investigation was begun in April 1964, to determine nondestructive methods and techniques for evaluating and characterizing graphite materials. The properties and behavior characteristics of graphite which are important to ablative applications were identified and correlated with the applicable NDT methods and techniques during the first year. Emphasis was directed in verification of the applicability of the various NDT techniques and correlation to characterize graphite in relation to service performance has been an item of major concern. Statistical analysis of these correlations has established the significance of the correlations for predicting the related material properties. An extensive analysis of the application of NDT flaw testing and properties evaluation in regard to quality and reliability is presented. A detailed discussion of infrared technique development activities for measuring thermal properties is also presented. The influence of attenuation and the related effects of frequency distortion on velocity measurements is evaluated and described.

Descriptors: (.. ....&....0 .... *Graphite, Nondestructive testing.. ....&....0 ....), Standards, Ablation, Thermal properties, Thermal shock, Radiometers, Measurement, Thermal stresses, Heat shields, Thermal conductivity, Attenuation, Thermodynamics, Surface properties, Quality control

Identifiers: Ablative materials, NTISDODXD

D1665H1 N77-12108/5ST NTIS Prices: PC$6.75/MF$3.00
Transonic Stability and Control Characteristics of a 0.015 Scale Model 69-0 of the Space Shuttle Orbiter with Forebody Rsi Modification in the NASA/LARC 8 Foot Tpt (LA72)

Ball, J. W.; Edwards, C. R.
Chrysler Corp., New Orleans, La. Space Div.
Fld: 1A, 22B, 51A, 84C STAR1503
Oct 76
155p
Rept No: NASA-CR-147644, DMS-DR-2309
Contract: NAS9-13247
Monitor: 18

Tests were conducted in the NASA/LaRC 8 foot transonic wind tunnel from March 26 through 31, 1976. The model was a 0.015 scale SSV Orbiter with forebody modifications to simulate slight reductions in the reusable surface insulation (RSI) thickness. Six component aerodynamic force and moment data were obtained at Mach numbers from 0.35 to 1.20 over an angle of attack range from -2 deg to 20 deg at sideslip angles of 0 deg and 5 deg. (Author)

Descriptors: *Space shuttle orbiters, *Surface stability, Forebodies, Transonic wind tunnels, Aerodynamic forces, Angle of attack, Mach number, Thermal insulation

Identifiers: NTISNASA

D0215B3 PB-258 555/2ST NTIS Prices: PC$5.00/MF$3.00
Semiconductor Measurement Technology: Progress Report July 1 to December 31, 1975

Bullis, W. Murray
National Bureau of Standards, Washington, D.C. Electronic Technology Div.*Defense Advanced Research Projects Agency, Arlington, Va.*Space and Missile Systems Organization, Los Angeles, Calif.*Strategic Systems Project Office (Navy), Crane, Ind.*Defense Nuclear Agency, Washington, D.C.
Fld: 9A, 20L, 14B, 46D, 49H, 86V GRAI7701
Oct 76
90p
Rept No: NBS-SP-400-25
Contract: ARPA Order-2397
Monitor: 18

Sponsored in part by Space and Missile Systems Organization, Los Angeles, Calif., Strategic Systems Project Office (Navy), Crane, Ind., and Defense Nuclear Agency, Washington, D.C. See also report dated Mar 76, PB-251 349.

This progress report describes NBS activities directed toward the development of methods of measurement for semiconductor materials, process control, and devices. Both in-house and contract efforts are included. The emphasis is on silicon device technologies. Principal accomplishments during this reporting period included (1) preliminary results of a systematic study of the effects of surface preparation on spreading resistance measurements; (2) development of an optical test for surface quality of sapphire; (3) development of a basis for an exposure sensitivity specification for photoresists; and (4) development of a modular cell concept for test structure design and layout. Also reported are the results of work on four-probe resistivity measurements, comparison of techniques for surface analysis, ion microprobe mass analysis, redistribution profiles, and thermally stimulated current response of interface states. Supplementary data concerning staff, publications, workshops and symposia, standards committee activities, and technical services are also included.

Descriptors: *Semiconductor devices, *Semiconductors, *Surface properties, *Quality control, *Silicon, Chemical analysis, Semiconductor doping, Defects, Integrated circuits, Measurement, Measuring instruments, Instrumentation, Electrical resistivity, Optical measuring instruments, Mass spectroscopy, Fabrication, Ion implantation, Photolithography, Test facilities, Hermetic seals, Thermal properties, Experimental design

Identifiers: Auger electron spectroscopy, Ion microprobes, Secondary ion mass spectroscopy, Metal oxide semiconductors, NTISCOMNBS, NTISDODA

D0082E4 N76-30445/0ST NTIS Prices: PC$4.00/MF$3.00
Environmental Charging of Spacecraft Surfaces: Tests of Thermal Control Materials for Use on the Global Positioning System Flight Space Vehicle. Part 1: Specimens 1 to 5

Stevens, N. J.; Klinect, V. W.; Berkopec, F. D.
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Fld: 11C, 13A, 22B, 71E, 84C, 84G STAR1421
Jul 76
42p
Rept No: NASA-TM-X-73467, E-8836
Monitor: 18

The NASA/USAF program on Environmental Charging of Spacecraft Surfaces consists of experimental efforts directed toward evaluating the response of materials to the environmental charged particle flux. Samples of thermal blankets and second surface mirrors of the type to be used on the Global Positioning System Flight Space Vehicle were tested to determine their response to electron flux. The primary result observed was that the ground connection of the metal layers of the blanket, as made by the baseline grounding technique using serrated washers and grommets, deteriorated with time at test. The discharges observed on the blankets were the glow type, not the 'lightning' strike observed on past specimens. Testing was performed at ambient laboratory temperatures. (Author)

Descriptors: *Spacecraft, *Thermal control coatings, Electrostatic charge, Spacecraft orbits, Aerospace environments, Charged particles, Electric discharges

Identifiers: Heat shielding, Environmental tests, NTISNASA

C7422D2 N76-26432/4ST NTIS Prices: PC$4.00/MF$3.00
Effect of a Surface-to-Gap Temperature Discontinuity on the Heat Transfer to Reusable Surface Insulation Tile Gaps

Throckmorton, D. A.
National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Fld: 22B, 20M, 84C STAR1417
Jun 76
35p
Rept No: NASA-TN-D-8233, L-10766
Monitor: 18

An experimental investigation is presented that was performed to determine the effect of a surface-to-gap wall temperature discontinuity on the heat transfer within space shuttle, reusable surface insulation, tile gaps submerged in a thick turbulent boundary layer. Heat-transfer measurements were obtained on a flat-plate, single-gap model submerged in a turbulent tunnel wall boundary layer at a nominal free-stream Mach number of 10.3 and free-stream Reynolds numbers per meter of 1.5 million, 3.3 million and 7.8 million. Surface-to-gap wall temperature discontinuities of varying degree were created by heating the surface of the model upstream of the instrumented gap. The sweep angle of the gap was varied between 0 deg and 60 deg; gap width and depth were held constant. A surface-to-gap wall temperature discontinuity (surface temperature greater than gap wall temperature) results in increased heat transfer to the near-surface portion of the gap, as compared with the heat transfer under isothermal conditions, while decreasing the heat transfer to the deeper portions of the gap. The nondimensionalized heat transfer to the near-surface portion of the gap is shown to decrease with increasing Reynolds number; in the deeper portion of the gap, the heat transfer increases with Reynolds number. (Author)

Descriptors: *Reusable heat shielding, *Space shuttles, Gaps, Heat transfer, Temperature effects, Temperature gradients, Thermal insulation, Tiles, Aerodynamic heating, Flat plates, Heat measurement, Reynolds number, Thermal control coatings, Turbulent boundary layer, Wind tunnel models

Identifiers: NTISNASA

C7415J4 N76-26261/7ST NTIS Prices: PC$4.00/MF$3.00
Environmental Charging of Spacecraft-Tests of Thermal Control Materials for Use on the Global Positioning System Flight Space Vehicle. Part 2: Specimen 6 to 9

Stevens, N. J.; Berkopec, F. D.; Blech, R. A.
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Fld: 22A, 22B, 84A, 84C STAR1417
Jun 76
44p
Rept No: NASA-TM-X-73436, E-8789
Monitor: 18

The NASA/USAF program on Environmental Charging of Spacecraft Surface consists, in part, of experimental efforts directed toward evaluating the response of materials to the environmental charged particle flux. Samples of thermal blankets of the type to be used on the Global Positioning System Flight Space Vehicles were tested to determine their response to electron flux. The primary result observed was that no discharges were obtained with the quartz-fiber-fabric-covered multilayer insulation specimen. The taped aluminized polyester grounding system used on all specimens did not appear to grossly deteriorate with time; however, the specimens require specific external pressure to maintain constant grounding system resistance. (Author)

Descriptors: *Charged particles, *Spacecraft construction materials, *Surface reactions, *Thermal control coatings, Dielectrics, Electrons, Flux (Rate), Multilayer insulation, Spacecraft design

Identifiers: NTISNASA

C6972L2 N76-23359/2ST NTIS Prices: PC$3.50/MF$2.25
Thermal Barrier Coating System

Stecura, S.; Liebert, C. H.
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Fld: 11C, 21E, 71E, 90E, 81D STAR1414
Filed 14 May 76
10p
Rept No: PAT-APPL-686 449, NASA-CASE-LEW-12554-1
Monitor: 18
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

A coating system is described which contains a bond coating and a thermal barrier coating. It is applied to metal surfaces such as turbine blades and provides both low thermal conductivity and improved adherence when exposed to high temperature gases or liquids. The bond coating contains NiCrAlY and the thermal barrier coating contains a reflective oxide. The reflective oxides ZrO_2-Y_2O_3 and ZrO_2-MgO have demonstrated significant utility in high temperature turbine applications.

Descriptors: *Metal surfaces, *Protective coatings, *Thermal control coatings, *Turbine blades, *Patent applications, High temperature fluids, Magnesium oxides, Nickel alloys, Thermal conductivity, Yttrium oxides, Zirconium oxides

Identifiers: Chromium containing alloys, Aluminum containing alloys, Yttrium containing alloys, NTISNASA

C6495G2 N76-17643/7ST NTIS Prices: PC$3.50/MF$2.25
Standardized Performance Tests of Collectors of Solar Thermal Energy: A Selectively Coated, Steel Collector with One Transparent Cover
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Fld: 10A, 97D STAR1408
Jan 76
7p
Rept No: NASA-TM-X-71870, E-8641
Monitor: 18

Basic test results are presented of a flat-plate solar collector whose performance was determined in solar simulator. The collector was tested over ranges of inlet temperatures, fluxes and coolant flow rates. Collector efficiency was correlated in terms of inlet temperature and flux level. (Author)

Descriptors: *Amorphous materials, *Solar energy absorbers, *Steel structures, *Thermal control coatings, *Solar collectors, Performance tests, Standardization, Flux (Rate), Heat flux, Solar flux, Solar simulators, Surface cooling, Temperature profiles, Thermal absorption

Identifiers: *Flat plate collectors, Thermal efficiency, NTISNASA

C6395L1 N76-16169/4ST NTIS Prices: PC$7.75/MF$2.25
The Effects of Solid Rocket Motor Effluents on Selected Surfaces and Solid Particle Size, Distribution, and Composition for Simulated Shuttle Booster Separation Motors

Jex, D. W.; Linton, R. C.; Russell, W. M.; Trenkle, J J.; Wilkes, D. R.
National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Fld. 21H, 81K, 84C STAR1407
12 Jan 76
218p
Rept No: NASA-TM-X-64975
Monitor: 18

A series of three tests was conducted using solid rocket propellants to determine the effects a solid rocket plume would have on thermal protective surfaces (TPS). The surfaces tested were those which are baselined for the shuttle vehicle. The propellants used were to simulate the separation solid rocket motors (SSRM) that separate the solid rocket boosters (SRB) from the shuttle launch vehicle. Data cover: (1) the optical effects of the plume environment on spacecraft related surfaces, and (2) the solid particle size, distribution, and composition at TPS sample locations.

Descriptors: *Plumes, *Solid rocket propellants, *Space shuttles, *Surface reactions, *Thermal control coatings, Composition (Property), Materials tests, Particle size distribution, Protective coatings

Identifiers: NTISNASA

C5763E4 N76-10978/4ST NTIS Prices: PC$6.75/MF$2.25
Effects of High Energy Simulated Space Radiation on Polymeric Second-Surface Mirrors

Eogdall, L. B.; Cannaday, S. S.
Boeing Aerospace Co., Seattle, Wash.
Fld: 03B, 54C STAR1401
Oct 75
165p
Rept No: NASA-CR-132725, D180-18014-2
Contract: NAS1-13530
Monitor: 18

A radiation effects experimental program was performed, in which second surface mirror type thermal control coatings were exposed to ultraviolet radiation, electrons, and protons simultaneously. Stability was assessed by making periodic spectral reflectance measurements in situ (and in air after testing for comparison). Solar absorption coefficients were derived by computer. Many of the exposed materials showed large amounts of degradation in reflectance absorptance, principally due to the electron exposure. A series of tests was conducted, leading to the identification of a modified second surface mirror that shows considerable improvement and promise for stability during thermal control applications in a charged particle space radiation environment. (Author)

Descriptors: *Mirrors, *Performance tests, *Radiation effects, *Solar simulation, *Thermal control coatings, Electron radiation, Graphs (Charts), Protective coatings, Proton irradiation, Reflectance, Spacecraft structures, Ultraviolet radiation

Identifiers: NTISNASA

C5591G2 AD-A017 502/6ST NTIS Prices: PC$3.50/MF$2.25
Lubricant Reservoir Systems: Thermal Considerations

Dormant, Leon M.; Feuerstein, Seymour
Aerospace Corp El Segundo Calif Chemistry and Physics Lab*Space and Missile Systems Organization, Los Angeles Air Force Station, Calif.
Fld: 13K, 20M, 99F, 72K GRAI7601
9 Oct 75
18p
Rept No: TR-0076(6270-30)-1
Contract: F04701-75-C-0076
Monitor: SAMSO-TR-75-239

The thermal conditions necessary to ensure that porous nylon lubricant reservoirs properly function as lubricant replenishment sources are derived by thermocynamic methodology. The porous nylon must be warmer than its surroundings by at least an amount delta T, which may be expressed by the relation delta T=-2 gamma V T sub B rH where T sub B is the system temperature, r is the nylon pore radius, and gamma, V, and H are the surface tension, the molar volume, and the molar heat of vaporization of the liquid lubricant, respectively.

Descriptors: *Oil reservoirs, *Lubricants, *Reservoirs, *Bearings, Thermodynamics, Lubrication, Replenishment, Nylon, Capillarity, Transport properties, Temperature control, Gradients, Heat, Methodology, Porous materials, Surface properties, Surface temperature, Interfacial tension, Heat of vaporization, Spacecraft, Spaceborne, Feeding, Surfaces, Pressure, Mechanical components, LaPlace transformation, Temperature

Identifiers: Kelvin equation, NTISDODXA, NTISDODAF

C5121D2 N75-24937/5ST NTIS Prices: PC$4.75/MF$2.25
Development of Space Stable Thermal Control Coatings for Use on Large Space Vehicles

Gilligan, J. E.; Harada, Y.
IIT Research Inst., Chicago, Ill. Technology Center.
Fld: 11C, 71E, 84C STAR1316
Feb 75
87p
Rept No: NASA-CR-143850, IITRI-C6233-48
Contract: NAS8-26791
Monitor: 18

The development of a large scale manufacturing method for the production of a stable zinc orthotitanate pigment is studied, with emphasis placed on the comprehensive analysis of the properties and environmental stability of oxalate precursor zinc orthotitanate pigments and of the preparative conditions (time and temperature) leading to optimum properties and optical stability. (Author)

Descriptors: *Coatings, *Solar reflectors, *Spacecraft structures, *Surface stability, *Temperature control, Environment effects, Heat shielding, Manufacturing, Oxalates, Pigments, Zinc coatings

Identifiers: NTISNASA

C4144B1 AD/A-004 081/6ST NTIS Prices: PC$3.75/MF$2.25
Definition of Thermal Control Surface Characteristics of Satellite Model C

Donabedian, Martin
Aerospace Corp El Segundo Calif Engineering Science Operations*Space and Missile Systems Organization, Los Angeles, Calif.
Fld: 22B, 17E, 84G, 63C GRAI7506
13 Jan 75
47p
Rept No: TR-0075(5484)-1
Contract: F04701-74-C-0075
Monitor: SAMSO-TR-75-29

Basic vehicle geometry, surface areas and thermal control surface characteristics and internal heat generation rates for the ERTS-1 were defined to permit generation of the infrared signature of the satellite under anticipated orbital conditions and operating modes. The ERTS-1, which operates in a 500 nmi altitude circular sun-synchronous polar orbit, uses both passive and active thermal control systems. Passive control is accomplished by the use of thermal control coatings (various white and aluminum paints) and insulation. Active control employs temperature-activated movable shutters to maintain the bulk of the electronic equipment between 17C (63F) and 25C (77F). Orbital temperature data are provided for some portions of the spacecraft.

Descriptors: *Scientific satellites, *Infrared signatures, Infrared detection, Thermal analysis, Thermal radiation, Thermophysical properties, Temperature control

Identifiers: ERTS-1 satellite, Thermal dissipation, NTISDODAF

C3641H2 N74-30006/2SL NTIS Prices: PC$8.25/MF$2.25
Improved Coating for Silica Fiber Based Ceramic Reusable Surface Insulation (Crsi)

Ormiston, T. J.
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
Fld: 11C, 71E STAR1219
Apr 74
102p
Rept No: NASA-CR-134653
Contract: NAS3-17793
Monitor: 18

A series of coatings was developed for the space shuttle type silica fiber insulation system and characterized for optical and physical properties. Reentry simulation tests were run using a radiant panel and also using a hypersonic plasma arc. The coatings produced had improved physical and optical properties as well as greater reuse capability over the GE version of the JSC-0042 coating. (Author)

Descriptors: *Ceramics, *Glass fibers, *Silicon dioxide, *Thermal control coatings, Aerodynamic heating, Protective coatings, Reentry, Space shuttles

Identifiers: NTISNASA

C3515H3 N74-29325/9 NTIS Prices: PC$4.75/MF$2.25
Analytic and Experimental Evaluation of Shadow Shields and Their Support Members for Thermal Control of Space Vehicles

Boyle, R. J.; Stochl, R. J.
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Fld: 20M, 81E STAR1218
Jun 74
138p
Rept No: NASA-TN-D-7612, E-7344
Monitor: 18

The thermal performance of shadow shields, and their support struts, for the thermal protection of cryogenic propellants in a simulated deep-space environment was investigated analytically and experimentally. Very low overall heat-transfer rates were obtained when highly reflective aluminized Mylar shadow shields were used. The thermal interactions between the shields and support struts were investigated with fair to good agreement between the analysis and experimental data. The exterior surface of both fiberglass and titanium struts was coated to reduce the heat input into the test tank. The vacuum level inside the test facility strongly influenced the heat-transfer rates. (Author)

Descriptors: *Cryogenic fluid storage, *Heat shielding, *Heat transfer, *Thermal protection, Mylar (Trademark), Spacecraft components, Surface properties, Temperature control

Identifiers: NTISNASA

C3515D3 N74-29289/7 NTIS Prices: PC$42.00/MF$2.25
Data Correlation and Analysis of Arc Tunnel and Wind Tunnel Tests of Rsi Joints and Gaps. Volume 2: Data Base

Christensen, H. E.; Kipp, H. W.
McDonnell-Douglas Astronautics Co., St. Louis, Mo.
Fld: 22B, 84C STAR1218
29 Jan 74
778p
Rept No: NASA-CR-134346, MDC-E1003-VOL-2
Contract: NAS9-13439
Monitor: 18

Seri-2.

Wind tunnel tests were conducted to determine the aerodynamic heating created by gaps in the reusable surface insulation (RSI) thermal protection system (TPS) for the space shuttle. The effects of various parameters of the RSI on convective heating characteristics are described. The wind tunnel tests provided a data base for accurate assessment of gap heating. Analysis and correlation of the data provide methods for predicting heating in the RSI gaps on the space shuttle. (Author)

Descriptors: *Space shuttles, *Thermal control coatings, *Thermal insulation, *Wind tunnel tests, Aerothermodynamics, Heat transfer, Surface properties, Thermodynamic properties

Identifiers: NTISNASA

C3515D2 N74-29288/9 NTIS Prices: PC$14.50/MF$2.25
Data Correlation and Analysis of Arc Tunnel and Wind Tunnel Tests of Rsi Joints and Gaps. Volume 1: Technical Report

Christensen, H. E.; Kipp, H. W.
McDonnell-Douglas Astronautics Co., St. Louis, Mo.
Fld: 22B, 84C STAR1218
29 Jan 74
230p
Rept No: NASA-CR-134345, MDC-E1003-VOL-1
Contract: NAS9-13439
Monitor: 18

Seri-2.

Heat transfer data measured in gaps typical of those under consideration for joints in space shuttle reusable surface insulation protection systems have been assimilated, analyzec and correlated. The data were obtained in four NASA facilities. Several types of gaps were investigated with emphasis on simple butt joints. Gap widths ranged from 0.07 to 0.7 cm and depths ranged from 1 to 6 cm. Laminar, transitional and turbulent boundary layer flows over the gap opening were investigated. Three-dimensional heating variations were observed within gaps in the absence of external flow pressure gradients. Heat transfer correlation equations were obtainec for several of the tests. Thermal protection system performance with and without gaps was compared for a representative shuttle entry trajectory. (Author)

Descriptors: *Space shuttles, *Thermal control coatings, *Thermal insulation, *Wind tunnel tests, Aerothermodynamics, Data acquisition, Heat transfer, Surface properties, Thermodynamic properties

Identifiers: NTISNASA

C3155G3 N74-22227/4 NTIS Prices: PC$3.00/MF$1.45
The Effects of Particle Size on the Optical Properties and Surface Roughness of a Glass-Balloon-Filled Black Paint

Heslin, T.; Heaney, J.; Harper, M.
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Fld: 11C, 71E STAR1213
May 74
9p
Rept No: NASA-TN-D-7643, G-7432
Monitor: 18

The effects of particle size on the optical properties and surface roughness of a glass-balloon-filled, carbon-pigmented paint were studied in order to develop a diffuse-reflecting, low-total-reflectance, low-outgassing black paint. Particle sizes ranged between 20 microns and 74 microns. Surface roughness was found to increase with increasing particle size. Relative total reflectance at near-normal incidence (MgO standard) of the filled paints was less than for the unfilled paint between 230 nm and 1800 nm. Total absolute reflectance at 546 nm decreased with increasing particle size at grazing angles of incidence. Near-normal, total emittance was greater for the filled paints than for the unfilled paint. Specularity decreased with increasing particle size over the range studied. (Author)

Descriptors: *Optical properties, *Paints, *Particle size distribution, *Reflectance, Materials tests, Pigments, Protective coatings, Thermal control coatings

Identifiers: NTISNASA

C2963I1 N74-20539/4 NTIS Prices: PC$4.00/MF$1.45
Spaceflight Performance of Silver Coated Fep Teflon as a Thermal Control Surface on the Imp-1 Spacecraft

Hoffman, R. H.
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Fld: 22B, 84G STAR1211
Apr 73
8p
Rept No: NASA-TM-X-66242, X-762-73-113
Monitor: 18

A second surface mirror type coating, vapor deposited silver on FEP Teflon, was used as a thermal control surface for one of the experiments aboard the Imp-I spacecraft. This coating was selected to obtain the low operating temperature required for this experiment. Initial flight temperature of this thermal control surface was -70.5 C, very close to the predicted value of -73 C and at a very satisfactory level. Since temperatures within the spacecraft interior are not at this desired low level, the detectors had to be mounted exterior to the spacecraft with a good view of space, preferably in an area shaded from sunlight. When this latter preference proved unobtainable, the detectors were mounted on an aluminum plate located on the exterior of the spacecraft, parallel to the spin axis but rotating about the solar vector. The mounting plate was approximately 6.5 inches by 7.5 inches by 0.125 inches thick. To achieve the desired temperature level with the mounting plate in such a location, the thermal design had to minimize not only the effects of the relatively warm spacecraft environment but also the effects of the incident solar energy. (Author)

Descriptors: *Explorer 18 satellite, *Spacecraft performance, *Teflon (Trademark), *Thermal control coatings, Low temperature, Metal vapors, Silver, Temperature control

Identifiers: NTISNASA

C0741K1 N73-17919 NTIS Prices: PC$3.00/MF$0.95
Analysis of Shape of Porous Cooled Medium for an Imposed Surface Heat Flux and Temperature

Siegel, R.
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Fld: 20M, 80P STAR1108
Mar 73
36p
Rept No: NASA-TN-D-7176, E-7104
Monitor: 18

The surface of a porous cooled medium is to be maintained at a specified design temperature while being subjected to uniform heating by an external source. An analytical method is given for determining the shape of the medium surface that will satisfy these boundary conditions. The analysis accounts for temperature dependent variations of fluid density and viscosity and for temperature dependent matrix thermal conductivity. The energy equation is combined with Darcy's law in such a way that a potential can be defined that satisfies Laplace's equation. All of the heat-transfer and flow quantities are expressed in terms of this potential. The determination of the shape of the porous cooled region is thereby reduced to a free-boundary problem such as in inviscid free jet theory. Two illustrative examples are carried out: a porous leading edge with coolant supplied through a slot and a porous cooled duct with a rectangular outer boundary. (Author)

Descriptors: *Cooling systems, *Heat transfer, *Porous materials, *Temperature control, Boundary layer flow, Thermal conductivity, Thermodynamic properties

Identifiers: NASA

C0242J3 AD-753 410 NTIS Prices: PC$4.85/MF$0.95
Degradation Mechanisms of Pigmented Coatings

Campbell, William B.; Cochran, Joe K. Jr
Ohio State Univ Research Foundation Columbus
Fld: 11C, 22B, 71E GRAI7304
Oct 72
87p*
Contract: F33615-71-C-1257
Project: AF-7342
Task: 734202
Monitor: AFML-TR-71-42-Pt-2

See also AD-725 754.

Oxygen transport in polymonomethylsiloxane was investigated and compared to polydimethylsiloxane properties. The effects of rutile pigmentation on the permeability, diffusion, and solubility of oxygen through polymonomethylsiloxane were investigated. Permeability and diffusion constants decreased with increasing pigment concentration and there was no evidence of oxygen sorption on the pigment. Relative adhesion of polydimethylsiloxane and polymonomethylsiloxane on rutile was predicted from water contact angles. Polymonomethylsiloxane was proposed to have the greater adhesion but was small in either case. The stability of dimethyl and monomethyl polysiloxanes pigmented with rutile and zinc oxide was evaluated in a simulated solar ultraviolet environment. (Author)

Descriptors: (.. ....&....0 .... *Paints, Degradation .. ....&....0 ....), (.. ....&....0 .... *Plastic coatings, Permeability.. ....&....0 ....), (.. ....&...-.0 .... *Silicone plastics, *Plastic paints .. ....&....0 ....), Diffusion, Oxygen, Rutile, Pigments, Zinc compounds, Ultraviolet radiation, Space environmental conditions, Absorption, Solubility, Surfaces

Identifiers: *Thermal control coatings, Polymer gas permeability, Poly(siloxane/dimethyl), Poly(siloxane/methyl), Zinc titanate

A4565L2 N72-20842 NTIS Prices: PC$3.00/MF$0.95
APOLLO Experience Report Thermal Design of APOLLO Lunar Surface Experiments Package

Harris, R. S. Jr
National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
Fld: 22A, 84B STAR1011
Mar 72
26p
Rept No: NASA-TN-D-6738, MSC-S-310

The evolution of the thermal design of the Apollo lunar surface experiments package central station from the basic concept to the final flight hardware is discussed, including results of development, prototype, and qualification tests that were used to verify that the flight hardware would operate adequately on the lunar surface. In addition, brief discussions of the thermal design of tests that were used to verify that the flight hardware would operate adequately on the lunar surface. In addition, brief discussions of the thermal design of experiments included in the experiments package are presented. The flight thermal performance is compared with analytical results and thermal-vacuum test results, and design modifications for future lunar surface experiment packages are presented. (Author)

Descriptors: *Apollo lunar surface experiments package, *Temperature control, *Thermal protection, Environmental tests , Mathematical models, Systems engineering

A3931D3 N72-12631 NTIS Prices: PC$3.00/MF$0.95
A Method of Treating the Non-Grey Error in Total Emittance Measurements

Heaney, J. B.; Henninger, J. H.
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Fld: 20F, 80H STAR1003
Dec 71
13p
Rept No: NASA-TN-D-6501, G-1026

Descriptors: *Emittance, *Protective coatings, *Thickness, Surface properties, Temperature control, Thermal insulation

A3445K4 N71-35150 NTIS Prices: PC$3.00/MF$0.95
THERMAL CONTROL FOR MOBLE PACKAGES IN THE DUSTY LUNAR ENVIRONMENT

Baker, R. H.; Langley, R. J.
Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
Fld: 13A, 69A STAR0921
Jun 71
83p
Rept No: NASA-CR-121874, TR-7L-2
Contract: NAS9-11540

Descriptors: *Lunar dust, *Lunar environment, *Lunar mobile laboratories, *Surface properties, *Thermal protection, *Thermal radiation, Infrared radiation, Radiation shielding, Radiative heat transfer

A2724D1 N71-27736 NTIS Prices: PC$3.00 MF$0.95
The Effects of Charged Particle and Uv Radiation on the Stability of Silvered and Aluminized Fep Teflon Second Surface Mirrors

Wappaus, W. A.
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Fld: 20H, 80J STAR0915
May 71
25p
Rept No: NASA-TM-X-65559, X-762-71-192
Contract: NAS5-11326

Prep- Prepared in Part By Electromech. Res., Inc., College Park, Md.

Descriptors: *Charged particles, *Radiation dosage, *Teflon (trademark), *Thermal control coatings, *Ultraviolet radiation , Aluminum, Electrons, Irradiation, Protons, Silver, Solar constant

A2061F3 N71-18484 NTIS Prices: PC$3.00 MF$0.95
DEVELOPMENT OF SPACE STABLE THERMAL CONTROL COATINGS TRIANNUAL REPORT, 1 MAY - 30 SEP. 1970

Zerlaut, G. A.
IIT Research Inst., Chicago, Ill. Technology Center.
Fld: 11C, 71E STAR0908
30 Nov 70
88p
Rept No: NASA-CR-103039, IITRI-U6002-94
Contract: NAS8-5379

Descriptors: *Protective coatings, *Radiation effects, *Temperature control, *Titanium oxides, *Zinc compounds, Paints, Spectral reflectance, Surface properties, Zinc coatings

A1614C3 AD-717 822 NTIS Prices: MF$0.95
Thermodynamics and Thermophysics of Space Flight Proceedings Held at Palo Alto, California on March 23-25, 1970

Cohan, Henry; Calvert, D. L.; Satterlee, H. M.
Lockheed Missiles and Space Co Sunnyvale Calif
Fld: 22B, 20M, 84A, 80P GRAI7106
Jan 71
296p
Contract: F44620-69-C-0120
Project: AF-9781
Task: 978101
Monitor: AFOSR-TR-71-0079
Availability: Paper copy available from Western Periodicals Company, 1300 Raymer St., North Hollywood, Calif. 91605. $17.00.

The newly developed engineering science of spacecraft temperature control continues to change at a rapid pace. As a means of assisting and encouraging the disemination of new developments a symposium was held at the Lockheed Research Labs. in 1970. The symposium was jointly sponsored by the Air Force Office of Scientific Research and the Lockheed Missiles and Space Co. The technical program of 17 papers in four broad catagories comprises the contents of this volume. Four general classes of papers are presented: New computational techniques with complex computer design and optimal control theory; point designs for a solar array, an antenna and an optics system; thermal control techniques for energy exchange with high flux rates, passive systems and coolant loop systems design; and materials development with special coatings and insulations for spacecraft surfaces. (Author)

Descriptors: (.. ....&....0 .... *Spacecraft, *Temperature control.. ....&....0 ....), (.. ....&....0 ....- *Space flight, Thermodynamics.. ....&....0 ....), Symposia, Solar radiation, Mathematical models, Surface properties, Perturbation theory, Optics, Satellites(Artificial), Antenna configurations, Programming(Computers), Materials, Thermal insulation, Lifting reentry vehicles

A1554F3 N71-11136 NTIS Price: PC$3.00
Thermal Control Surface Research at the Royal Aircraft Establishment

Smith, A. E.
Royal Aircraft Establishment, Farnborough (England).
Fld: 22B, 84G STAR0902
Nov 68
37p
Rept No: RAE-TR-68276

Descriptors: *Aerospace engineering, *Control surfaces, *Space environment simulation, *Spacecraft electronic equipment, *Temperature control, Great britain, Systems engineering

A0651D4 N70-28727 CFSTI Prices: HC$3.00 MF$0.65
THE PREPARATION AND SPACE ENVIRONMENT BEHAVIOR OF A SILICATE-TREATED ZINC OXIDE THERMAL CONTROL COATING - 101

Colony, J. A.
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Fld: 11C, 71E STAR0814
May 70
13p
Rept No: NASA-TM-X-63935, X-713-70-194

Descriptors: *Protective coatings, *Spacecraft shielding, *Thermal insulation, *Zinc oxides, Aerospace environments, Control surfaces, Radiation effects

A0642H2 N70-28082 CFSTI Prices: HC$3.00 MF$0.65
DEVELOPMENT OF SPACE STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, 1 OCT. - 31 DEC. 1969

Ashford, N. A.; Zerlaut, G. A.
IIT Research Inst., Chicago, Ill. Technology Center.
Fld: 11C, 71E STAR0814
20 Feb 70
54p
Rept No: NASA-CR-102654, IITRI-U6002-85
Contract: NAS8-5379

Descriptors: *Protective coatings, *Space environment simulation, *Thermal stability, Irradiation, Paints, Surface reactions, Titanates, Zinc compounds

6945E3 N69-37549 CFSTI Prices: HC$6.00 MF$0.95
THERMAL CONTROL SURFACES

Downey, M. J.; Schamle, G.
European Space Research and Technology Center, Noordwijk (Netherlands).
Fld: 22B, 20M, 944 STAR0722
Feb 69
30p
Rept No: ESRO-TN-73

Coll- 30 P Refs Conf- Presented At the 6th Esro Summer School, Noordwijk, Neth., 1968

Descriptors: *Absorptance, *Heat balance, *Reflectance, *Spacecraft environments, *Thermal radiation, Control, Emittance, Radiation shielding, Solar simulation, Spacecraft structures, Surface temperature, Thermal environments, Thin films

6944J1 N69-37466 CFSTI Prices: HC$6.00 MF$0.95
THE DETERMINATION OF SURFACE TEMPERATURES

Janes, M.
European Space Research and Technology Center, Noordwijk (Netherlands).
Fld: 14B, 945 STAR0722
Feb 69
33p
Rept No: ESRO-TN-78

Coll- 33 P Refs Conf- Presented At the 6th Esro Summer School, Noordwijk, Neth., 1968

Descriptors: *Surface temperature, *Temperature measuring instruments, *Thermal radiation, *Thermistors, *Thermocouples, Black body radiation, Conferences, Emissivity, Infrared radiation, Isotherms, Radiation laws, Temperature control, Temperature measurement

6943K3 N69-37389 CFSTI Prices: HC$6.00 MF$0.95
DETERMINATION OF THE THERMAL BEHAVIOUR OF A SATELLITE

Toussaint, M.
European Space Research and Technology Center, Noordwijk (Netherlands).
Fld: 22B, 944 STAR0722
Feb 69
48p
Rept No: ESRO-TM-107

Coll- 48 P Refs Lang- in French, English Summary Conf- Presented At the Esro Summer School, Noordwisk, Neth., 1968

Descriptors: *Aerospace environments, *Artificial satellites, *Temperature measurement, *Thermal environments, *Thermal simulation, Conferences, Error analysis, Mathematical models, Solar radiation, Surface properties, Temperature control

6494H3 N69-29596 CFSTI Prices: HC$6.00 MF$0.95
DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, 1 NOV. 1967 - 29 FEB. 1968

Noble, G. ; Zerlaut, G. A.
IIT Research Inst., Chicago, Ill. Technology Center.
Fld: 11C, 920 STAR0716
15 Apr 68
37p
Rept No: NASA-CR-102203, IITRI-U6002-63
Contract: NAS8-5379, IITRI PROJ. U6002

Descriptors: *Encapsulating, *Paints, *Protective coatings, *Radiation shielding, *Spacecraft construction materials, *Zinc compounds, Resins, Surface layers, Thermal degradation, Titanates

6493H4 N69-29346 CFSTI Prices: HC$6.00 MF$0.95
DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, 1 MAR. - 31 AUG. 1968

Marcour, M. ; Noble, G. ; Zerlaut, G. A.
IIT Research Inst., Chicago, Ill. Technology Center.
Fld: 11C, 22B, 920, 944 STAR0716
25 Oct 68
86p
Rept No: NASA-CR-101580, IITRI-U6002-69
Contract: NAS8-5379

Descriptors: *Aerospace environments, *Coatings, *Control surfaces, *Thermal radiation, *Titanates, *Zinc compounds, Gamma rays, Optical properties, Pigments, Proton beams, Reflectometers. Ultraviolet radiation

6244D1 AD-688 908 CFSTI Prices: HC$6.00 MF$0.95
THERMAL CONTROL SURFACE RESEARCH AT THE ROYAL AIRCRAFT ESTABLISHMENT

Smith, A. E.
Royal Aircraft Establishment Farnborough (England)
Fld: 22B, 20M, 944 USGRDR6915
Nov 68
37p
Rept No: RAE-TR-68276

The report defines four basic classes of thermal control surface and the research being carried out on each type of surface. Details are given of the apparatus used to measure the reflectance properties of the surfaces and the facilities available to simulate the space environment. Finally, a description is given of the preliminary design of a satellite-borne experiment designed to test thermal control surfaces in space. (Author)

Descriptors: (.. ....&....0 .... *Satellites(Artificial), Thermal stresses.. ....&....0 ....), Thermal stability, Surface properties, Space environmental conditions, Reflectivity, Degradation, Plastic paints, Pigments, Vacuum, Life expectancy, Ultraviolet radiation, Photon bombardment, Great Britain

6113H3 AD-687 149 CFSTI Prices: HC$6.00 MF$0.95
SURVEY OF THERMAL CONTROL TECHNIQUES FOR EXTRAVEHICULAR SPACE SUITS

Hedge, Jack C.
IIT Research Inst Chicago Ill
Fld: 6Q, 6E, 22A USGRDR6913
Dec 68
28p
Rept No: IITRI-J6028-1
Contract: AF 33(615)-3468
Project: AF-7164
Task: 716411
Monitor: AMRL-TR-68-87

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)

Descriptors: (.. ....&....0 .... *Pressure suits, *Thermal insulation.. ....&....0 ....), (.. ....&....0 - .... *Extravehicular activity, Pressure suits .. ....&....0 ....), Thermal properties, Thermal stability, Astronauts, Protective clothing, Space environmental conditions, Heat, Temperature, Solar radiation, Albedo, Spacecraft, Orbital trajectories, Thermal conductivity , Surface properties, Mobility, Gloves, Touch, Design, Metabolism, Body temperature, Body fluids, Heat production(Biology)

6043H2 AD-686 428 CFSTI Prices: PC$6.00 MF$0.95
THE ORIGIN OF DEPOSITS FORMED ON THE SURFACE OF THERMAL CONTROL MATERIALS BY THE ACTION OF EXTREME ULTRAVIOLET RADIATION

Mangold, Vernon L.
Air Force Flight Dynamics Lab Wright-Patterson AFB Ohio
Fld: 11C USGRDR6912
Feb 69
30p
Rept No: AFFDL-TR-68-155
Project: AF-7340

The phenomenon of surface deposits formed on selected white thermal control samples during extreme ultraviolet irradiation has been investigated. Information obtained in this experimental program indicates that the surface deposit was unique to the coating sample and not the result of the environmental chamber system contamination. (Author)

Descriptors: (.. ....&....0 .... *Organic coatings, Ultraviolet radiation.. ....&....0 ....), Spacecraft, Thermal radiation, Space simulation chambers, Emissivity, Absorption, Reflectivity, Deposits

Identifiers: Reflective coatings

5763A3 PB-182 493 CFSTI Prices: PC$6.00 MF$0.95
STRUCTURAL THERMAL-CONTROL COATINGS
National Aeronautics and Space Administration Washington, D. C. Technology Utilization Div.
Fld: 11C, 22D USGRDR6908
1968
35p

Part of technical support package for Tech Brief 68-10553.

Descriptors: (.. ....&....0 .... *Coatings, Temperature control.. ....&....0 ....), (.. ....&....0 .... *Space surveillance systems, Telemetering antennas .. ....&....0 ....), (.. ....&....0 .... *Telemetering antennas, Protective treatments.. ....&....0 ....), Thermal insulation, Corrosion inhibition, Structural parts, Deflection, Thermal radiation, Solar radiation, Paints, Paint applicators, Surface properties, Aging(Materials)

Identifiers: DSIF(Deep Space Instrumentation Facility), Deep space instrumentation facility

5412E2 AD-678 799 CFSTI Prices: PC$3.00 MF$0.95
OPTICAL SOLAR REFLECTOR: A HIGHLY STABLE, LOW AS/E SPACECRAFT THERMAL CONTROL SURFACE

Marshall, K. N.; Breuch, R. A.
Lockheed Missiles and Space Co Palo Alto Calif Lockheed Palo Alto Research Lab
Fld: 20M, 11C, 22B USGRDR6903
10 Jun 68
6p
Contract: AF 33(615)-5066, NAS2-3063

Revision of manuscript received 16 Oct 67.
Availability: Pub. in Jnl. of Spacecraft and Rockets, v5 n9 p1051-1056 Sep 68.

A stable, low AS/E spacecraft thermal control surface has been developed. The material is basically a second-surface mirror composed of silver vacuum deposited on high-purity fused silica which gives AS/E = 0.062 at 295K. Experimental determinations of A/S for 180 and 295K and measurements of E for the temperature range of 83 to 750K are presented. A summary of laboratory simulated exposures to Van Allen proton, artificial electron belt, solar wind proton, solar ultraviolet, and slected combinations of environments is presented and demonstrates that the material is stable. In addition, sinusoidal and random vibration, mechanical shock, and thermal cycling test results are reported which show mechanical integrity for the imposed test conditions. Results of studies to determine suitable application techniques are discussed. The Optical Solar Reflector was found to have the lowest AS/E of any production thermal control coating available; it affords a solution for reliable thermal control of many advanced spacecraft systems. (Author)

Descriptors: (.. ....&....0 .... *Spacecraft, *Thermal insulation.. ....&....0 ....), (.. ....&....0 .... *Optical coatings, Reflectivity.. ....&....0 ....), Solar radiation, Mirrors, Spectra(Infrared), Spectra(Visible + ultraviolet), Absorption, Thermal radiation, Stability, Substrates, Particle spectra, Solar flares, Solar wind

Identifiers: *OSR(Optical Solar Reflector), *Optical solar reflectors, Solar absorptance

5325I1 N68-36113 CFSTI Prices: PC$6.00 MF$0.95
DEVELOPMENT OF PHASE-CHANGE COATINGS FOR USE AS VARIABLE THERMAL CONTROL SURFACES FINAL REPORT, 8 MAR. 1967 - 8 MAR. 1968

Griffin, R. N.; Linder, B.
General Electric Co., Philadelphia, Pa. Missile and Space Div.
Fld: 20M, 22B STAR0623
8 Mar 68
71p
Rept No: NASA-CR-66695
Contract: NAS1-6166

Descriptors: *Phase transformations, *Protective coatings, *Spacecraft structures, *Thermal protection, Organic compounds, Plastics, Product development, Space flight, Stearates, Surface properties, Temperature effects

4641L4 N68-20989 CFSTI Prices: PC$6.00 MF$0.95
DESIGN, TEST, AND PERFORMANCE OF THE MARINER 5 TEMPERATURE CONTROL REFERENCE

Carroll, W. F.
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Fld: 22B STAR0611
1 Apr 68
31p
Rept No: NASA-CR-93921, JPL-TR-32-1250
Contract: NAS7-100

Descriptors: *Mariner space probes, *Paints, *Performance tests, *Protective coatings, *Temperature control, Mars probes, Space flight, Structural design, Surface properties, Thermal degradation

4072A2 N67-40586 CFSTI Prices: PC$6.00 MF$0.95
VOYAGER CAPSULE PHASE B. VOLUME III - SURFACE LABORATORY SYSTEM. PART C2 - SUBSYSTEM FUNCTIONAL DESCRIPTION FINAL REPORT
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mcdonnell Aircraft Corp., St. Louis, Mo.
Fld: 22B, 22A STAR0524
31 Aug 67
191p
Rept No: NASA-CR-89696, F694, VOL. III, PT. C2
Contract: NAS7-100, JPL-952000

Prepared for Jpl

Descriptors: *Landing module, *Mars surface, *Space capsule, *Spacecraft component, *Voyager project, Cable, Capsule, Component, Control, Design, Entry, Equipment, Exploration, Instrument, Laboratory, Landing, Mars (planet), Module, Packaging, Pyrotechnics, Science, Soft, Space, Spacecraft, Subsystem, Surface, Thermal, Unmanned, Vehicle

4071L4 N67-40584 CFSTI Prices: PC$6.00 MF$0.95
VOYAGER CAPSULE PHASE B. VOLUME III - SURFACE LABORATORY SYSTEM. PART B3 - ALTERNATIVES, ANALYSES, SELECTION FINAL REPORT
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mcdonnell Aircraft Corp., St. Louis, Mo.
Fld: 22B, 22A STAR0524
31 Aug 67
202p
Rept No: NASA-CR-89694, F694, VOL. III, PT. B3
Contract: NAS7-100, JPL-952000

Prepared for Jpl

Descriptors: *Landing module, *Mars surface, *Space capsule, *Systems design, *Voyager project, Alternative, Cable, Capsule, Control, Design, Instrument, Laboratory, Landing, Mars (planet), Mechanical, Module, Packaging, Pyrotechnics, Science, Space, Structural, Subsystem, Surface, System, Thermal

4065J2 N67-40445 CFSTI Prices: PC$6.00 MF$0.95
VOYAGER CAPSULE, PRELIMINARY DESIGN, PHASE B. VOLUME III - SURFACE LABORATORY SYSTEM. SECTION I - SURFACE LABORATORY FINAL REPORT
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Martin Co., Denver, Colo.
Fld: 22B STAR0524
31 Aug 67
567p
Rept No: NASA-CR-89724, FR-22-103, VOL. III, SECT. I
Contract: NAS7-100, JPL-952001

Prepared for Jpl

Descriptors: *Laboratory, *Planetary surface, *Space capsule, *Voyager project, Capsule, Command, Constraint, Control, Design, Equipment, Mars, Mission, Packaging, Planetary, Power, Preliminary, Requirement, Space, Structure, Subsystem, Support, Surface, Telemetry, Thermal

4063B1 N67-40089 CFSTI Prices: PC$6.00 MF$0.95
EFFECT OF ENVIRONMENT ON THERMAL CONTROL COATINGS INTERIM REPORT

Freund, T. ; Morrison, S. R.
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Stanford Research Inst., Menlo Park, Calif.
Fld: 11C STAR0524
1 Sep 67
25p
Rept No: NASA-CR-89555, IR-1
Contract: NAS7-100, JPL-951522

Prepared for Jpl

Descriptors: *Additive, *Degradation, *Protective coating, *Surface chemistry, *Ultraviolet radiation, Control device, Damage, Electron, Hole, Iron, Material testing, Optical property, Optimum, Recombination, Resistance, Thermal insulation, Vacuum effect, Zinc oxide

3915B2 N67-36489 CFSTI Prices: PC$6.00 MF$0.95
DEVELOPMENT OF THERMAL TESTING TECHNIQUES AT HIGH SOLAR INTENSITIES FINAL REPORT, 13 AUG. 1965 - 13 MAY 1967

Marshall, K. N.; Rolling, R. E.
Lockheed Missiles and Space Co., Palo Alto, Calif. Aerospace Sciences Lab.
Fld: 22B, 20M STAR0521
Jun 67
87p
Rept No: NASA-CR-73098
Contract: NAS2-3164
Monitor: 18

Descriptors: *Environmental testing, *Solar simulation, *Spacecraft performance, *Temperature control, *Thermal protection, Analysis, Arc, Carbon, Computer, Control, Design, Environment, Filament, Lamp, Mathematics, Method, Model, Performance, Program, Protection, Simulation, Solar, Spacecraft, Surface, Temperature, Test, Testing, Thermal, Tungsten, Xenon

3914C1 N67-36080 CFSTI Prices: PC$6.00 MF$0.95
DEVELOPMENT OF PHASE-CHANGE COATINGS FOR USE AS VARIABLE THERMAL CONTROL SURFACES FINAL REPORT

Griffin, R. N.; Linder, B.
General Electric Co., Philadelphia, Pa. Missile and Space Div.
Fld: 22B, 11C STAR0521
Sep 67
59p
Rept No: NASA-CR-66394
Contract: NAS1-5330
Monitor: 18

Descriptors: *Protective coating, *Spacecraft shielding, *Temperature control, *Thermal absorption, Absorption, Binder, Change, Coating, Control, Evaporation, Irradiation, Phase, Protection, Shielding, Spacecraft, Stability, Surface, Temperature, Thermal, Vacuum, Variable

3864D4 N67-34625 CFSTI Prices: PC$6.00 MF$0.95
HANDBOOK OF OPTICAL PROPERTIES FOR THERMAL CONTROL SURFACES, VOLUME III FINAL REPORT

Breuch, R.
Lockheed Missiles and Space Co., Sunnyvale, Calif.
Fld: 20M, 11B, 22B STAR0520
25 Jun 67
81p
Rept No: NASA-CR-87484, LMSC-A847882, VOL. III
Contract: NAS8-20353
Monitor: 18

Descriptors: *Control surface, *Handbook, *Temperature control, *Thermal insulation, *Thermophysical property, Absorber, Coating, Control, Data, Design, Flat, High performance, Information, Insulation, Material, Optical, Property, Reflector, Solar, Spacecraft, Surface, Temperature, Thermal, Thermophysical

3683K4 N67-30889 CFSTI Prices: PC$6.00 MF$0.95
A STUDY OF THE BLISTERING OF METAL SURFACES BY SOLAR SYSTEM IONS FINAL REPORT

Milacek, L. H.; Wolfe, J. R.
Avco Corp., Tulsa, Okla. Oklahoma Univ. Research Inst., Norman. Electronics Div.
Fld: 11F STAR0517
Jun 67
94p
Rept No: NASA-CR-85570, TR-G-230-F
Contract: NASW-1431
Monitor: 18

Prepared Jointly With Oklahoma Univ.

Descriptors: *Aluminum, *Damage, *Gold, *Proton irradiation, Annealing, Blister, Control, Electron, Hydrogen, Irradiation, Low energy, Microscopy, Optical, Pit, Proton, Space flight, Surface, Thermal

3523K4 N67-26581 CFSTI Prices: PC$6.00 MF$0.95
MARINER MARS 1964 TEMPERATURE CONTROL HARDWARE DESIGN AND DEVELOPMENT

Carroll, W. ; Coyle, G. G.; Von Delden, H.
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Fld: 22B STAR0514
1 Jun 67
30p
Rept No: NASA-CR-84293, JPL-TR-32-955
Contract: NAS7-100
Monitor: 18

Descriptors: *Heat shield, *Mariner iv space probe, *Surface finish, *Temperature control, Antenna, Coating, Configuration, Control, Design, Finish, Heat, Louver, Material, Paint, Shield, Simulator, Surface, Temperature, Thermal

3423E2 N67-24641 CFSTI Prices: PC$6.00 MF$0.95
RESEARCH ACHIEVEMENTS REVIEW, VOLUME II
National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Fld: 22A, 20M STAR0512
1966
56p
Rept No: NASA-TM-X-53557
Monitor: 18

Descriptors: *Control surface, *Infrared instrument, *Pegasus satellite, *Thermophysics, *Ultraviolet radiation, Absorption, Coating, Conductivity, Control, Criterion, Emissivity, Environment, Infrared, Instrument, Material, Model, Optical, Radiation, Radiometer, Satellite, Space, Spectrometer, Surface, Thermal, Ultraviolet

3261H3 N67-20298 CFSTI Prices: PC$6.00 MF$0.95
THE THERMAL ENVIRONMENT IN SPACE

Husain, L. A.
European Space Research Organization, Paris (France).
Fld: 22A STAR0509
Dec 66
26p
Rept No: ESRO-TM-49
Monitor: 18

Presented At the Esro Summer School, Oxford, 28 Aug. 1964

Descriptors: *Heat sink, *Satellite design, *Thermal environment, Coating, Control, Design, Earth, Effect, Environment, Heat, Radiation, Reflection, Satellite, Sink, Solar, Space, Surface, Temperature, Thermal, Transfer

3143G3 N67-17513 CFSTI Prices: PC$3.00 MF$0.95
VACUUM CHAMBER HEAT-TRANSMISSION ANALYSIS

Ellis, W. E.; Guy, W. W.
National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
Fld: 20M, 22A STAR0507
Feb 67
13p
Rept No: NASA-TM-X-1355
Contract: 914-50-80-02-72
Monitor: 18

Descriptors: *Deep space, *Heat transfer, *Pressure effect, *Thermal simulation, *Vacuum chamber, Analysis, Apollo spacecraft, Chamber, Conduction, Control, Deep, Effect, Emission, Environment, Error, Gas, Heat, Level, Pressure, Simulation, Space, Surface, Temperature, Test, Thermal, Transfer, Vacuum, Vehicle

3142J3 N67-17182 CFSTI Prices: PC$6.00 MF$0.95
LOW SOLAR ABSORPTANCE AND EMITTANCE SURFACES UTILIZING VACUUM DEPOSITED TECHNIQUES FINAL REPORT, 29 JUN. 1965 - 28 SEP. 1966
Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
Fld: 11C, 22B STAR0507
Oct 66
82p
Rept No: NASA-CR-73039, REPT.-4-06-66-13
Contract: NAS2-3063
Monitor: 18

Descriptors: *Optical measurement, *Protective coating, *Spacecraft structure, *Vapor deposition, Absorption, Aluminum alloy, Characteristics, Coating, Control, Deposition, Irradiation, Measurement, Optical, Protection, Quartz, Silica glass, Silver, Solar, Spacecraft, Structure, Surface, System, Thermal, Vapor

1281F3 AD-602 894 CFSTI Price: PC$3.00
PASSIVE THERMAL CONTROL COATINGS

Gilligan, J. E.; Sibert, M. E.; Greening, T. A.
Lockheed Missiles and Space C Palo Alto Calif
USGRDR
1943
2p
Rept No: 5 10 63 9
Contract: AF04 647 787 , AF04 695 136

Rept. presented at Seventh Meeting of the Refractory Composites Working Group, Palo Alto, California, March 12-14, 1963.

Development of a unique class of coating material systems for passive temperature control surfaces is described. Certain alkali silicate-based all-inorganic coating systems offer considerable promise for current longterm applications in this area of space technology. The major objective of this program is the development of coating systems with stable alpha/epsilon values of less than 0.30 after 2,000 to 6,000 sun-hour exposures under space environmental conditions, with lesser emphasis in systems with alpha/epsilon values of up to 1.20. (Author)

Descriptors: (.. ....&....0 .... *SPACECRAFT, *THERMAL INSULATION.. ....&....0 ....), (.. ....&....0 .... *COATINGS, SPACECRAFT.. ....&....0 ....), (.. ....&....0 .... *THERMAL INSULATION, OPTICAL COATINGS .. ....&....0 ....), HEAT SHIELDS, SURFACES, SOLAR RADIATION, THERMAL RADIATION, CERAMIC COATINGS, FOILS, PAINTS, SPACE ENVIRONMENTAL CONDITIONS, SILICON COMPOUNDS, OXIDES, REFLECTION, AERODYNAMIC HEATING, STABILITY, ALKALI METALS, PHYSICAL PROPERTIES, ENVIRONMENT TESTS, REFLECTORS, SATELLITES (ARTIFICIAL), ORGANIC COATINGS, FLAME SPRAYING, SURFACE PROPERTIES, OPTICAL PROPERTIES, ABSORPTION, COMPOSITE MATERIALS

Identifiers: PLASMA SPRAY COATING

1065C2 N66-38414 CFSTI Prices: PC$6.00 MF$0.95
AN ANALOG STUDY OF THE PASSIVE THERMAL BEHAVIOR OF AN ORBITING SPACE STATION

Clark, L. G.; Wilson, J. W.
National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Fld: 22A STAR0423
Oct 66
38p
Rept No: NASA-TN-D-3654

Descriptors: *Analog computer, *Orbital space station, *Thermal environment, Control, Crew, Equation, Fourier analysis, Heat transfer, Linear, Module, Spacecraft, Study, Surface, Wall

1053L4 N66-37048 CFSTI Prices: PC$6.00 MF$0.95
THERMOPHYSICS RESEARCH AT MSFC RESEARCH ACHIEVEMENTS REVIEW, SERIES NO. 2
National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Fld: 20M STAR0422
1965
42p
Rept No: NASA-TM-X-53490

Descriptors: *Computer program, *Infrared radiation, *Space environment, *Temperature control, *Thermal environment, *Thermophysics, Coating, Computer, Control, Effect, Emissivity, Environment, Experiment, Flight, Infrared, Measurement, Program, Property, Radiation, Research, Solid, Space, Surface, Temperature, Thermal

1014K2 N66-32946 CFSTI Prices: PC$6.00 MF$0.95
PROCEEDINGS OF CONFERENCE ON ACTIVE TEMPERATURE CONTROL

Mook, C. P.
National Aeronautics and Space Administration, Washington, D. C.
Fld: 20M STAR0419
1964
92p
Rept No: NASA-TM-X-56165

Conf. Held At Nasa Headquarters, 9 Apr. 1964

Descriptors: *Conference, *Spacecraft environment, *Temperature control, *Thermal radiation, Capillary, Control, Convection, Electronic, Equipment, Forced, Heat, Louver, Lunar, Mariner program, Micrometeoroid, Pump, Radiation, Shield, Surface, System, Temperature, Thermal

0965D1 N66-27748 CFSTI Prices: PC$6.00 MF$0.95
USE OF THERMAL RERADIATIVE EFFECTS IN SPACECRAFT ATTITUDE CONTROL

Peterson, C. A.
Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
Fld: 20M STAR0415
May 66
60p
Rept No: NASA-CR-75450, CSR-T-66-3
Contract: NASR-249

Descriptors: *Attitude control, *Oscillation, *Spacecraft control, *Thermal radiation, *Vibration damping, Absorption, Attitude, Control, Damping, Delay, Emission, Lag, Nonconservative, Radiation, Spacecraft, Surface, Thermal, Time, Torque, Vibration

0931I1 N66-23749 CFSTI Prices: PC$6.00 MF$0.95
DEVELOPMENT OF SPACE-STABLE THERMAL-CONTROL COATINGS TRIANNUAL REPORT, SEP. 20, 1965 - JAN. 20, 1966

Rubin, G. A.; Zerlaut, G. A.
IIT Research Inst., Chicago, Ill. Technology Center.
Fld: 11C STAR0412
21 Feb 66
57p
Rept No: NASA-CR-74469, IITRI-U6002-36
Contract: NAS8-5379

Descriptors: *Paint, *Photolysis, *Pigment, *Protective coating, *Temperature control, Aluminum, Calcium, Coating, Control, Inorganic, Magnesium, Methyl, Oxide, Polymer, Protection, Silicate, Silicone, Stability, Surface, Temperature, Thermal, Ultraviolet, Zinc, Zirconium

0872K1 N66-17576 CFSTI Prices: PC$3.00 MF$0.95
EFFECTS OF CRYODEPOSITS ON SPACECRAFT THERMAL CONTROL SYSTEMS

Mc Connell, D. G.
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Fld: 20M STAR0408
1966
17p
Rept No: NASA-TM-X-52181

Presented At Natl. Conf. on Space Maintenance and Extra Vehicular Activities, Orlando, Fla., 1-3 Mar. 1966, Sponsored By Af and Martin Co.

Descriptors: *Cryogenics, *Deposit, *Heat regulation, *Spacecraft design, Array, Carbon, Control, Design, Dioxide, Hydrogen, Peroxide, Property, Radiative, Shadow, Shield, Spacecraft, Surface, Thermal, Vapor, Water

0855A4 N66-16186 CFSTI Prices: PC$3.00 MF$0.95
SPACECRAFT TEMPERATURE CONTROL BY THERMOSTATIC FINS PROGRESS REPORT, 1 JUN. - 30 NOV. 1965

Maples, D. ; Wiebelt, J. A.
Oklahoma State Univ., Stillwater. School of Mechanical Engineering.
Fld: 20M STAR0407
Dec 65
11p
Rept No: NASA-CR-69877
Grant: NSG-454

Descriptors: *Control surface, *Cooling fin, *Temperature control, Control, Cooling, Feasibility, Fin, Heat, Insulation, Model, Movement, Simulation, Space, Spacecraft, Surface, Temperature, Testing, Thermal

0824L3 N66-13574 CFSTI Prices: PC$6.00 MF$0.95
STUDY OF A HIGH RESOLUTION FACSIMILE SYSTEM EXPERIMENT ON THE SURFACE OF THE PLANET MARS FINAL REPORT
Aeronutronic, Newport Beach, Calif. Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Fld: 22A STAR0404
25 Feb 65
427p
Rept No: NASA-CR-68626, U-3034
Contract: JPL-950996

Prepared for Jpl

Descriptors: *Facsimile transmission, *Mars (planet), *Planetary landing, Antenna, Camera, Capsule, Communication, Control, Design, Dynamics, Electronics, Facsimile, Hardness, High resolution, Impact, Landing, Planetary, Power, Source, Space, Sterilization, Technology, Telecommunication, Thermal, Transmission, Transmitter

0805I4 N66-11251 CFSTI Prices: PC$6.00 MF$0.95
PHYSICS ON THE MOON, SELECTED TOPICS CONCERNING LUNAR EXPLORATION

Bucher, G. C.; Stern, H. E.
National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
Fld: 3B STAR0402
Nov 65
275p
Rept No: NASA-TN-D-2944

Descriptors: *Lunar atmosphere, *Lunar environment, *Lunar exploration, *Moon, Atmosphere, Characteristic, Conference, Control, Energy, Environment, Exploration, History, Landing, Life, Lunar, Mission, Physical, Radiation, Site, Support, Surface, Thermal

0705F4 N65-24293 CFSTI Prices: PC$6.00 MF$0.95
STUDY OF MICROMETEOROID DAMAGE TO THERMAL CONTROL MATERIALS FINAL TECHNICAL REPORT, 7 FEB. - 3 NOV. 1964

Friichtenicht, J. F.
Space Technology Labs., Inc., Redondo Beach, Calif. Physical Electronics Lab.
STAR0313
4 Feb 65
60p
Rept No: NASA-CR-62810, STL-4146-6009-SU-000
Contract: NAS8-11149

Descriptors: *Environment simulation, *Micrometeoroid, *Space environment, *Temperature control, Bombardment, Coating, Control, Damage, Environment, Metal, Property, Protection, Radiation, Simulation, Space, Surface, Thermodynamics

0194J3 Patent 3,176,933
THERMAL CONTROL OF SPACE VEHICLES

Clemmons, Dewey L. Jr
Fld: 22B, 11C USGRDR4014
6 Apr 65
Monitor: 18

Available from Commissioner of Patents, Washington, D.C., 20231, $0.25

The space vehicle is of the type similar to the Echo I satellite. It is carried into space in the nose cone of a missile. The vehicle has an exterior aluminum surface. A thickness of the aluminum surface is chemically converted into an amorphous phosphate layer.

Descriptors: (.. ....&....0 .... *Satellites(Artificial), Temperature control.. ....&....0 ....), Communication satellites(Passive), Patents, Phosphate coatings, Aluminum, Surfaces, Laminates, Composite materials, Inflatable structures, Polyester plastics, Foils

0181B1 Patent 3,177,933
THERMAL SWITCH

Bozajian, John M.
Fld: 13, 12 USGRDR4012
13 Apr 65
Monitor: 18

Available from Commissioner of Patents, Washington, D.C., 20231, $0.25

The thermal switch is suited to the thermal control of spacecraft components to maintain constant temperature conditions irrespective of cyclic solar radiation environments. A pair of thermal contacts are provided in heat exchange relation with a pair of high conductivity surfaces thermally insulated from each other. A bi-metallic member is used to mount one of the contacts for movement into and out of engagement with the other contact in response to temperature variation of the first surface above and below a predetermined temperature.

Descriptors: (.. ....&....0 .... *Temperature control, Spacecraft.. ....&....0 ....), (.. ....&....0 .... *Heat exchangers, Temperature control.. ....&....0 ....), (.. ....&....0 .... *Temperature sensitive elements, Spacecraft.. ....&....0 ....), Patents, Heat transfer, Thermal conductivity, Surfaces, Temperature sensitive elements, Space environmental conditions

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 850 122L 22/2 21/8.1 21/8.2 21/2
AEROSPACE CORP EL SEGUNDO CALIF LAB OPERATIONS

A REVIEW OF AVAILABLE ROCKET PLUME
CONTAMINATION RESULTS, (U)

DEC 68 71P BORSON,E. N. ;LANDSBAUM,E.
M. ;
REPT. NO. TR-0200(4250-20)-2
CONTRACT: F04701-68-C-0200
MONITOR: SAMSO TR-69-82

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SAMSO (SMSDI-STINFO) LOS ANGELES AIR FORCE
STATION, CALIF. 90045.

DESCRIPTORS: (*LIQUID PROPELLANT ROCKET ENGINES, EXHAUST GASES), (*SOLID PROPELLANT ROCKET ENGINES, EXHAUST GASES), (*SPACECRAFT COMPONENTS, CONTAMINATION), LIQUID ROCKET PROPELLANTS, COMBUSTION PRODUCTS, THERMAL RADIATION, HEATING, PAINTS, THERMAL INSULATION, BIPROPELLANTS, ULTRAVIOLET RADIATION, MONOPROPELLANTS, OPTICAL GLASS, MIRRORS, COMBUSTION DEPOSITS, SOLAR CELLS, DAMAGE, ATTITUDE CONTROL SYSTEMS, MANNED SPACECRAFT, LIGHT TRANSMISSION, SOLAR RADIATION, ABSORPTION, SATELLITES(ARTIFICIAL), CONTROLLABLE-THRUST ROCKET MOTORS, CHEMICAL CONTAMINATION, EROSION, INFRARED RADIATION, DEPOSITION, REFLECTIVITY, ABSORPTION SPECTRA (U)
IDENTIFIERS: APOLLO, GEMINI, IMPINGEMENT, PEGASUS SATELLITE, PLUMES(RADIATION), PULSE MOTORS (U)

A DETAILED REVIEW OF THE AVAILABLE EXPERIMENTAL DATA ON THE CONTAMINATION OF SPACECRAFT SUBSYSTEMS FROM ROCKET EXHAUSTS IS GIVEN. CONTAMINATION CAN OCCUR AS THE RESULT OF HEATING, CHEMICAL ATTACK, MECHANICAL EROSION OR THE DEPOSITION OF SOLID OR LIQUID MATERIALS. RESULTS FROM HEATING THERMAL CONTROL COATINGS ARE PRESENTED; HOWEVER, THERE ARE NO DATA THAT SEPARATE THE THERMAL EFFECTS OF ROCKET EXHAUSTS FROM OTHER EFFECTS. ALSO PROVIDED ARE TYPICAL ROCKET EXHAUST COMPOSITIONS. THE NONEQUILIBRIUM PRODUCTS PRODUCED DURING PULSE OPERATION OF LIQUID BIPROPELLANT ENGINES ARE DESCRIBED. CHEMICAL ATTACK DOES NOT APPEAR TO BE A PROBLEM; HOWEVER, THERE ARE NO AVAILABLE DATA. EXAMPLES OF MECHANICAL EROSION ARE PRESENTED BUT ARE CURRENTLY UNEXPLAINABLE. THE MAJOR PROBLEM IS DEPOSITION AND DAMAGE DURING PULSE OPERATION OF LIQUID BIPROPELLANT ENGINES. THE EFFECT ON SOLAR CELLS, OPTICAL GLASSES, MIRRORS, THERMAL CONTROL (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 849 949   11/3   11/7   22/2
OKLAHOMA STATE UNIV STILLWATER DEPT OF MECHANICAL ENGINEERING

COMBINED EFFECTS OF ELECTRON-SOLAR RADIATION.   (U)

DESCRIPTIVE NOTE: FINAL REPT. APR 67-JUN 68,
JAN 69   54P   WIEBELT,JOHN A. ;
CONTRACT: F33615-67-C-1577
PROJ: AF-1309
TASK: 130908
MONITOR: AFFDL   TR-68-122

UNCLASSIFIED REPORT

DESCRIPTORS: (*SPACECRAFT CABINS, TEMPERATURE CONTROL), (*PLASTIC PAINTS, THERMAL INSULATION), (*THERMAL INSULATION, ENVIRONMENTAL TESTS), (*PIGMENTS, ABSORPTION), SPACE ENVIRONMENTS, ELECTRON IRRADIATION, ULTRAVIOLET RADIATION, TITANIUM COMPOUNDS, DIOXIDES, DEGRADATION, SOLAR RADIATION, SILICONE PLASTICS   (U)
IDENTIFIERS: TITANIUM(IV) OXIDE   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 841 387L 22/2 20/13
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

PROCEEDINGS OF THE JOINT AIR FORCE-NASA THERMAL
CONTROL WORKING GROUP, 16, 17 AUGUST 1967, (U)

AUG 68 743P JOHNSON,WARREN P. ;BOEBEL,
CARL P. ;
REPT. NO. AFML-TR-68-198
PROJ: AF-7340
TASK: 734007

UNCLASSIFIED REPORT
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7 DEC 72. OTHER REQUESTS FOR THIS DOCUMENT MUST BE
REFERRED TO DIRECTOR, AIR FORCE MATERIALS LAB.,
ATTN: MANE. WRIGHT-PATTERSON AFB, OHIO
45433.

DESCRIPTORS: (*SATELLITES(ARTIFICIAL), THERMAL INSULATION), (*THERMAL INSULATION, SYMPOSIA), DESIGN, THERMAL ANALYSIS, THERMAL CONDUCTIVITY, THERMAL STABILITY, THERMAL RADIATION, PROTECTIVE TREATMENTS, DIFFERENTIAL THERMAL ANALYSIS, REFLECTIVITY, OPTICAL COATINGS, SOLAR RADIATION, MISSION PROFILES, COATINGS, RADIATORS(HEATING AND COOLING), SPACECRAFT COMPONENTS, HEAT SHIELDS, FLAME DEFLECTORS, DETECTORS, SOLAR CELLS, PAINTS, ABSTRACTS (U)

THIS REPORT IS A COMPILATION OF PROCEEDINGS WITH AN INTRODUCTION AND SUMMARY PREPARED BY THE CONFERENCE COMMITTEE, DESCRIBING THE INFORMATION DISCUSSED AT THE THERMAL CONTROL WORKING GROUP MEETING HELD AT THE SHERATON-DAYTON HOTEL, DAYTON, OHIO, ON 16 - 17 AUGUST 1967. THE REPRESENTATIVES OF APPROXIMATELY 40 ORGANIZATIONS ATTENDED AND CONTRIBUTED TO DISCUSSIONS PERTAINING TO THE THERMAL DESIGN OF SPACECRAFT, DEVELOPMENT OF ADVANCED THERMAL CONTROL COATINGS, DEGRADATION OF COATINGS TO THE SPACE ENVIRONMENT, AND COATINGS SPACE (SATELLITE) EXPERIMENTS. CORRELATION AND DEVIATIONS OF ANALYTICAL THERMAL DESIGN TEST SIMULATION, AND FLIGHT DATA IS PRESENTED FOR A NUMBER OF AIR FORCE AND NASA SATELLITES. THE MEETING WAS DESIGNED TO PROMOTE DISCUSSION OF SATELLITE PROBLEMS AND TO ALLOW DESIGNERS TO PRESENT THEIR VIEW ON THE PAST PROGRESS AND FUTURE DEVELOPMENT EFFORTS IN THE AREA OF THERMAL CONTROL COATINGS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 841 084 20/13 22/2
AIR FORCE FLIGHT DYNAMICS LAB WRIGHT-PATTERSON AFB OHIO

THERMAL TEST OF A MODEL SPACE VEHICLE. PART II. EXPERIMENTAL RESULTS AND COMPARISON WITH ANALYSIS, (U)

AUG 68 58P FELDMANIS,C. J. ;
REPT. NO. AFFDL-TR-67-42-PT-2
PROJ: AF-6146
TASK: 614617

UNCLASSIFIED REPORT
DISTRIBUTION: NO FOREIGN WITHOUT APPROVAL OF DIRECTOR, AIR FORCE FLIGHT DYNAMICS LAB., ATTN: FDFE. WRIGHT-PATTERSON AFB, OHIO 45433.

DESCRIPTORS: (*SPACECRAFT, *THERMAL STABILITY), MODELS(SIMULATIONS), SPACE SIMULATION CHAMBERS, ANALYSIS OF VARIANCE, THERMAL RADIATION, THERMAL CONDUCTIVITY, HEAT FLUX, THERMAL ANALYSIS, DIFFUSION COATING (U)
IDENTIFIERS: *SOLAR SIMULATION (U)

THIS REPORT PRESENTS EXPERIMENTAL RESULTS OF A THERMAL PERFORMANCE TEST ON A MODEL SPACE VEHICLE. THE MODEL VEHICLE WAS DESIGNED TO EVALUATE ANALYTICAL TECHNIQUES DEVELOPED IN A PREVIOUS STUDY PROGRAM. THE MODEL VEHICLE WAS DIVIDED INTO THREE COMPARTMENTS. ONE OF THE COMPARTMENTS CONTAINED SIMULATED EQUIPMENT BOXES COATED WITH A DIFFUSE COATING, WHILE THE OTHER TWO COMPARTMENTS HAD A NUMBER OF HIGHLY SPECULAR SURFACES. THE EXPERIMENTAL RESULTS WERE COMPARED WITH THE FOLLOWING TWO ANALYTICAL MODELS: (1) WHERE RADIATION ANALYSIS IS BASED UPON DIRECTIONAL THERMAL RADIATION PROPERTIES AND FOR THE SPECULARITY AND/OR DIFFUSENESS OF THESE PROPERTIES, AND (2) WHERE RADIATION ANALYSIS IS BASED UPON THE ORDINARY DIFFUSE ASSUMPTION. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 840 281 11/6 1/3 13/8
AIR FORCE FLIGHT DYNAMICS LAB WRIGHT-PATTERSON AFB
OHIO

AEROSPACE STRUCTURAL POTENTIAL OF BERYLLIUM,
DISPERSION STRENGTHENED METALS, AND TANTALUM. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. APR-AUG 67,
AUG 68 100P COLLIER,K. I. ;RAMSEY,C.
L. ;BARNETT,F. E. ;INGRAM,J. C. , JR;
REPT. NO. AFFDL-TR-68-51
PROJ: AF-1368

UNCLASSIFIED REPORT

DESCRIPTORS: (*AIRFRAMES, HEAT RESISTANT ALLOYS),
(*BERYLLIUM, AIRFRAMES), (*HEAT RESISTANT ALLOYS,
DISPERSION HARDENING), (*TANTALUM ALLOYS, AEROSPACE
CRAFT), STRUCTURAL MEMBERS, NICKEL, COBALT, PHYSICAL
PROPERTIES, CORROSION RESISTANCE, MANUFACTURING,
CORROSION INHIBITION, COATINGS, (U)COATINGS (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD-D002 172   7/3   11/9   11/3
DEPARTMENT OF THE AIR FORCE WASHINGTON D C

2,3,7,8-TETRAAMINODIBENZOTHIOPHENE 5,5-DIOXIDE
AND PROCESS THEREFOR. (U)

DESCRIPTIVE NOTE: PATENT,
DEC 75   6P   SICREE,ALBERT J. ;ARNOLD,
FRED E. ;
REPT. NO. PAT-APPL-526 191, PATENT-3 929 832

UNCLASSIFIED REPORT
GOVERNMENT-OWNED INVENTION AVAILABLE FOR LICENSING.
COPY OF PATENT AVAILABLE COMMISSIONER OF PATENTS,
WASHINGTON, D.C. 20231 $0.50.
SUPPLEMENTARY NOTE: SUPERSEDES AD-D000 392.

DESCRIPTORS: *SYNTHESIS(CHEMISTRY), *THERMAL
STABILITY, *PATENTS, QUINOLINES, CONDENSATION
REACTIONS, HEAT RESISTANT PLASTICS, PROTECTIVE
COATINGS, POLYMERIC FILMS, SPACE SYSTEMS (U)
IDENTIFIERS: *QUINOLINE/SULFONYL-THIENYL, PAT-
CL-260-329.3, LADDER POLYMERS (U)

BENZOTHIOPHENEDIOXIDEISOQUINOLINE LADDER POLYMERS
ARE SYNTHESIZED BY THE CONDENSATION OF 2,3,7,8-
TETRAAMINODIBENZOTHIOPHENES-5,5-DIOXIDE WITH AN
AROMATIC TETRACARBOXYLIC ACID OR DIANHYDRIDE THEREOF.
THE HIGHLY FUSED, AROMATIC-HETEROCYCLIC POLYMERS SO
PREPARED HAVE A HIGH DEGREE OF THERMAL STABILITY, A
PROPERTY THAT RENDERS THEM PARTICULARLY USEFUL FOR
HIGH TEMPERATURE APPLICATIONS, SUCH AS FOR PLASTIC
COMPOSITES, FIBROUS MATERIALS AND PROTECTIVE
COATINGS. (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL508

AD- 850 261   11/3   22/2
ARNOLD ENGINEERING DEVELOPMENT CENTER ARNOLD AIR FORCE
STATION TENN

COMBINED SPACE ENVIRONMENTAL EFFECTS ON
SPACECRAFT COATINGS, PHASE II.   (U)

DESCRIPTIVE NOTE: FINAL REPT. 31 JUL-12 AUG 68,
APR 69   29P   SOUTHERLAN,R. E. ;
REPT. NO. AEDC-TR-69-74
CONTRACT: F40600-69-C-0001
PROJ: ARO-SR0801

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COMMANDER, SAMSO (SMSDI-STINFO) LOS ANGELES AIR
FORCE STATION, CALIF. 90045.
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH ARO,
INC., ARNOLD AIR FORCE STATION, TULLAHOMA,
TENN.

DESCRIPTORS: (*SPACECRAFT COMPONENTS, PROTECTIVE
TREATMENTS), (*PROTECTIVE TREATMENTS, SPACE
ENVIRONMENTS), VACUUM APPARATUS, THERMAL STABILITY,
CLEANING, SOLAR RADIATION, MEASUREMENT, SURFACE
PROPERTIES, VISUAL INSPECTION   (U)
IDENTIFIERS: *PROTECTIVE COATINGS   (U)

COMBINED SOLAR AND VACUUM EFFECTS ON VARIOUS
SPACECRAFT COATINGS HAVE BEEN STUDIED IN A 247-HR
TEST. LABORATORY MEASUREMENTS OF THERMAL RADIATIVE
PROPERTIES WERE OBTAINED. COATING TEMPERATURES
WERE MEASURED CONTINUOUSLY WHILE EXPOSED TO ONE SOLAR
CONSTANT, AND SOLAR ABSORPTIVITY-EMISSIVITY RATIOS
WERE CALCULATED. THE EFFECTS OF SURFACE
CONTAMINATION WITH A DIFFUSION PUMP OIL AND THE
EFFECTIVENESS OF A CLEANING TECHNIQUE WERE EVALUATED.
(AUTHOR)   (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 834 691L   7/2   11/7   22/2   5/2
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION HOUSTON TEX
MANNED SPACECRAFT CENTER

TRIS NON-METALLIC MATERIALS DOCUMENT REPORT BY
DOCUMENT CATEGORY. (U)

MAR 68   291P
MONITOR: IDEP   501.00.00.00-H9-01

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AND EVALUATION GROUP (CODE 262), ATTN:
GIDEP OFFICE. CORONA, CALIF. 91720
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH GENERAL
ELECTRIC.

DESCRIPTORS: (*MANNED SPACECRAFT, NONMETALS),
(*NONMETALS, DOCUMENTS), REPORTS, INFORMATION RETRIEVAL,
INDEXES, FLAMMABILITY, PLASTICS, ACRYLIC RESINS,
ADHESIVES, CEMENTS, FOILS(MATERIALS), COATINGS,
FASTENINGS, TEXTILES, CONTAINERS, TAPES, LUBRICANTS,
POLYMERS, EMBEDDING SUBSTANCES, EPOXY RESINS, LAMINATES,
ELASTOMERS, SILICONES, HALIDES, GLASS TEXTILES,
ISOCYANATE PLASTICS, ETHYLENES, NYLON, RUBBER, WIRE,
ASBESTOS, SPACECRAFT COMPONENTS, SPARE PARTS, THERMAL
INSULATION (U)
IDENTIFIERS: APOLLO, POLYETHYLENE TEREPHTHALATE,
POLYMERIC FILMS, TETRAFLUOROETHYLENE RESINS (U)

TRIS IS THE NASA/MSC TECHNICAL RELIABILITY
INFORMATION SYSTEM. IN IT IS DEPOSITED ALL
APOLLO SPACECRAFT PARTS AND MATERIALS
REFERENCE DOCUMENTS. THIS DOCUMENT LISTS ALL
DOCUMENTS PERTAINING TO NONM-METALLIC MATERIALS.
(AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD-B014 104L 11/3 20/8
MCDONNELL DOUGLAS ASTRONAUTICS CO-EAST ST LOUIS MO

INVESTIGATION OF CONTAMINATION EFFECTS ON
THERMAL CONTROL MATERIALS. (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. 15 MAY 74-14
AUG 75,
MAR 76 84P HUGHES,THOMAS A. ;BONHAM,
THOMAS E. ;ALLEN,THOMAS H. ;LINFORD,RODNEY
M. F. ;
CONTRACT: F33615-73-C-5091
PROJ: AF-7340
TASK: 734007
MONITOR: AFML TR-76-5

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TEST AND EVALUATION; NOV 75. OTHER REQUESTS FOR
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FORCE MATERIALS LAB., ATTN: MBE. WRIGHT-
PATTERSON AFB, OHIO 45433.
SUPPLEMENTARY NOTE: SEE ALSO REPT. NO. AFML-TR-74-
218, DATED JAN 75, AD-B004 283L.

DESCRIPTORS: *CONTAMINANTS, *THERMAL INSULATION,
*PROTECTIVE COATINGS (U)
IDENTIFIERS: SILICONE COMPOUNDS, SCATTERING,
LASER COMMUNICATIONS, SILICA, FABRICS,
KINETICS, SPACECRAFT, ARTIFICIAL SATELLITES,
LASERS, OPTICAL EQUIPMENT, THICK FILMS,
INFRARED EQUIPMENT, ELLIPSOMETERS, QUARTZ,
BALANCES, REFLECTORS, POLARIZATION, OPTICAL
PROPERTIES, SOLAR RADIATION, SUBSTRATES,
MONOMERS, POLYMERS, DEPOSITION, EVAPORATION,
OUTGASSING, VAPOR PRESSURE, MOLECULAR
WEIGHT (U)

CONTAMINATION KINETICS STUDIED ON THICK FILMS FROM
DC-704 AND RTV-602 (COMMERCIAL GRADE) USING
BOTH INFRARED ELLIPSOMETRY AND QUARTZ CRYSTAL
MICROBALANCES, CONFIRMED THAT MONOMERS EXPERIENCE
CONSTANT DEPOSITION RATES AND REEVAPORATION RATES,
WHILE POLYMERS HAVE AN EXPONENTIAL DECAY IN SUCH
AREAS. KINETICS DATA WAS ALSO OBTAINED ON A
PURIFIED FORM OF RTV-602 WHICH SHOWED SIGNIFICANTLY
LOWER OUTGASSING RATES, AND ON SR-585 SILICONE
ADHESIVE. LIMITED DATA WAS ALSO OBTAINED FOR
RTV'S -106 AND -560. MEASUREMENTS WERE MADE TO
OBTAIN EFFECTIVE MOLECULAR WEIGHT DATA ON OUTGASSING
SPECIES AND THEIR VAPOR PRESSURE. HOWEVER, THE
MOLECULAR WEIGHT DATA WAS NOT CONSIDERED RELIABLE DU(U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD-B010 716L   22/2
MARTIN MARIETTA AEROSPACE DENVER COLO DENVER DIV

HANDBOOK NONMETALLIC MATERIALS. (U)

DEC 74   320P
CONTRACT: NAS1-13177
MONITOR: GIDEP   501.00.00.00-F3-01

UNCLASSIFIED REPORT
DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; 5 MAY 76. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO OFFICER-IN-CHARGE (CODE 8033), FLEET ANALYSIS CENTER, ATTN: GIDEP OPERATIONS CENTER, NAVAL WEAPONS STATION, SEAL BEACH, CORONA, CALIF. 91720.

DESCRIPTORS: (*NONMETALS, THERMAL DEGRADATION), (*SPACECRAFT COMPONENTS, THERMAL DEGRADATION), HANDBOOKS, SPACECRAFT, ACTIVATION ENERGY, TETRAFLUOROETHYLENE RESINS, TEST METHODS, DACRON, EXPOSURE(GENERAL), ENVIRONMENTAL TESTS, SIMULATION, VACUUM CHAMBERS, PHYSICAL PROPERTIES, MECHANICAL PROPERTIES, SEALANTS, LUBRICANTS, PAINTS, POLYIMIDE RESINS, INKS, FILMS, FABRICS, SILICONES, PHENOLIC PLASTICS, POLYAMIDE PLASTICS, EPOXY RESINS, THERMAL INSULATION, ELECTRICAL INSULATION, MASS SPECTROSCOPY, THERMOCHEMISTRY, SPECIFICATIONS, FLUORINATED HYDROCARBONS, POLYURETHANE RESINS (U)
IDENTIFIERS: *VIKING MARS LANDER CAPSULE (U)

THIS DOCUMENT CONTAINS DATA ON THE FOLLOWING TYPES OF MATERIALS: SEALANTS, POTTING COMPOUNDS, LUBRICANTS, PAINTS AND FINISHES, INKS, FILMS, FABRICS, ENCAPSULANTS, ELASTOMERS, STRUCTURAL PLASTICS, ABLATIVES, ADHESIVES, AND ELECTRICAL AND THERMAL INSULATORS. 60 DIFFERENT MATERIALS ARE REPRESENTED HEREIN. THE INFORMATION PRESENTED HAS, AS A MINIMUM, THERMOCHEMICAL DATA SHOWING DEGRADATION AS A FUNCTION OF TEMPERATURE FROM ROOM TEMPERATURE THROUGH 500 C. THESE DATA INCLUDE ACTIVATION ENERGIES FOR THERMAL DEGRADATION, RATE CONSTANTS, AND EXO- AND/OR ENDOTHERMS. UNIQUE FACILITIES FOR DETERMINING PHYSICAL PROPERTIES IN-SITU WERE DEVELOPED TO HANDLE THE ENVIRONMENTAL EXPOSURE AND MATERIAL QUALIFICATION TEST REQUIREMENTS ESTABLISHED FOR THE VIKING MARS LANDER CAPSULE. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD-B008 182L 11/3 22/2 11/2 11/9
20/6

AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

ML-101 THERMAL CONTROL COATING SPACEFLIGHT
EXPERIMENT. (U)

DESCRIPTIVE NOTE: FINAL REPT. JAN 72-JAN 74,
AUG 75 87P PRINCE,DANIEL E. ;
REPT. NO. AFML-TR-75-17
PROJ: AF-7340
TASK: 734007

UNCLASSIFIED REPORT
DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; NOV 74. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE MATERIALS LAB., ATTN: MBE, WRIGHT-PATTERSON AFB, OHIO 45433.

DESCRIPTORS: (*THERMAL INSULATION, SPACECRAFT), (*TEMPERATURE CONTROL, COATINGS), (*COATINGS, DEGRADATION), SCIENTIFIC SATELLITES, EARTH ORBITS, SPACE ENVIRONMENTS, SIMULATION, REFLECTORS, MIRRORS, SOLAR RADIATION, ALUMINA, FABRICS, SILICON DIOXIDE, SILICONE PLASTICS, RARE EARTH COMPOUNDS, EUROPIUM COMPOUNDS, OXIDES, TETRAFLUOROETHYLENE RESINS, COMPUTER PROGRAMS, COMPUTERIZED SIMULATION, THERMOPHYSICAL PROPERTIES, COMPOSITE MATERIALS, TIME, TEMPERATURE, ABSORPTION SPECTRA, ALUMINUM, CONTAMINATION (U)
IDENTIFIERS: P-72-1 SPACECRAFT (U)

THIS REPORT DESCRIBES A THERMAL CONTROL COATINGS EXPERIMENT CONDUCTED ON THE AIR FORCE P72-1 SATELLITE WHICH WAS LAUNCHED INTO A LOW EARTH POLAR ORBIT IN OCTOBER OF 1972. THE OBJECTIVES OF THIS EXPERIMENT WERE TO MEASURE THE AMOUNT OF DEGRADATION OF EXPERIMENTAL THERMAL CONTROL COATINGS AFTER EXPOSURE TO THE SPACE ENVIRONMENT AND TO CORRELATE THESE RESULTS WITH THOSE OF SPACE EXPOSURE FOR THE SAME COATINGS MEASURED IN GROUND-BASED LABORATORY SIMULATION EQUIPMENT. BASED ON SELECTED DATA FROM OVER 5000 REVOLUTIONS COVERING A PERIOD OF ONE YEAR, IT WAS FOUND THAT ALL THE COATINGS INITIALLY DEGRADED TO A GREATER DEGREE THAN EXPECTED, POSSIBLY DUE TO CONTAMINATION. THE MOST STABLE COATINGS WERE OPTICAL SOLAR REFLECTORS AND THE LEAST STABLE WAS A WHITE ALPHA-AL2O3 PIGMENTED COATING. AN EXPERIMENTAL FABRIC MATERIAL SHOWED GREATER STABILITY THAN STATE-OF-THE-ART WHITE COATINGS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD-B004 283L 22/2 11/3 20/6
MCDONNELL DOUGLAS ASTRONAUTICS CO-EAST ST LOUIS MO

INVESTIGATION OF CONTAMINATION EFFECTS ON
THERMAL CONTROL MATERIALS. (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. 14 MAY 73-14
JUN 74,
JAN 75 106P HUGHES,THOMAS A. ;ALLEN,
THOMAS H. ;LINFORD,RODNEY M. F. ;BONHAM,
THOMAS E. ;
CONTRACT: F33615-73-C-5091
PROJ: AF-7340
TASK: 734007
MONITOR: AFML TR-74-218

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THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE
MATERIALS LAB., ATTN: MBE, WRIGHT-PATTERSON
AFB, OHIO 45433.

DESCRIPTORS: (*COATINGS, *CONTAMINATION),
(*MIRRORS, CONTAMINATION), (*TEMPERATURE
CONTROL, COATINGS), (*SPACECRAFT COMPONENTS,
CONTAMINATION), SUBSTRATES, POLYMERS,
CONTAMINANTS, SURFACES, FINISHES, COLORANTS,
OPTICS, OPTICAL PROPERTIES, DEPOSITION, RATES,
EVAPORATION, REFLECTANCE, SPACECRAFT, SPACE
SIMULATION CHAMBERS, ULTRAVIOLET RADIATION, ELECTRON
BEAMS, PROTON BEAMS, GOLD, TETRAFLUOROETHYLENE
RESINS, PAINTS, ALUMINUM COATINGS, METAL COATINGS,
CERAMIC COATINGS, OPTICAL COATINGS (U)
IDENTIFIERS: *THERMAL CONTROL COATINGS (U)

RESULTS ARE DESCRIBED OF HIGHLY PRECISE
MEASUREMENTS OF DEPOSITION RATES OF POLYMERIC
CONTAMINANTS ON VARIOUS TYPES OF THERMAL CONTROL
SURFACES, AND THEIR SUBSEQUENT REEVAPORATION RATES
UNDER A SIMULATED SPACE ENVIRONMENT. RESULTS ARE
ALSO PRESENTED ON THE CHANGES IN BIDIRECTIONAL
REFLECTANCE OF A GOLD MIRROR DUE TO CONTAMINATION AND
SUBSEQUENT IRRADIATION BY ULTRAVIOLET ENERGY AND
ELECTRONS AND PROTONS. THE EFFECT OF CONTAMINATION
AND RADIATION ON THE HEMISPHERICAL REFLECTANCE AND
SOLAR ABSORPTANCE OF SECOND SURFACE MIRRORS WAS ALSO
STUDIED. THE PRESENCE OF RADIATION WAS FOUND TO
HAVE A PROFOUND INFLUENCE ON CONTAMINATION KINETICS,
AND SOME TOTALLY UNEXPECTED RESULTS OCCURRED IN THE
BIDIRECTIONAL REFLECTANCE MEASUREMENTS OF THE GOLD
MIRRORS AS THEY WARMED FROM CRYOGENIC TEMPERATURES. (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD-B004 158L   11/1   11/4
SPAR AEROSPACE PRODUCTS LTD MALTON (ONTARIO)

TEMPERATURE CAPABILITY OF DC-6-1104
ADHESIVE. (U)

DESCRIPTIVE NOTE: TECHNICAL MEMO.,
APR 74   14P   NARASIMHAN,L. ;MUNRO,A. ;
REPT. NO. SPAR-TM.1074
MONITOR: GIDEP   501.01.60.00-CL-03

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DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; 30 MAY 75. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO OFFICER-IN-CHARGE (CODE 862), FLEET MISSILE SYSTEMS ANALYSIS AND EVALUATION GROUP ANNEX, ATTN: GIDEP ADMINISTRATION OFFICE. CORONA, CALIF. 91720.

DESCRIPTORS: (*ADHESIVE TAPES, COMPOSITE MATERIALS), (*COMPOSITE MATERIALS, ACCEPTANCE TESTS), ADHESIVES, SILICONE PLASTICS, SANDWICH CONSTRUCTION, ADHESIVE BONDING, TEST METHODS, PEEL STRENGTH, THERMAL CYCLING TESTS, HIGH TEMPERATURE, LOW TEMPERATURE, METAL COATINGS, SILVER, ALUMINUM COATINGS, TETRAFLUOROETHYLENE RESINS, POLYAMIDE PLASTICS, STAINLESS STEEL, SUBSTRATES, THERMAL STABILITY, SPACECRAFT COMPONENTS, FLEXIBLE MATERIALS (U)
IDENTIFIERS: DOW CORNING DC-6-1104 ADHESIVE, KAPTON, TEFLON (U)

PEEL TESTS AT ELEVATED TEMPERATURE AND THERMAL CYCLING TESTS WERE PERFORMED ON DC-6-1104, A VISCOUS LIQUID SILICONE ADHESIVE TO DETERMINE THE ABILITY OF THE ADHESIVE TO WITHSTAND SUCH THERMAL-MECHANICAL ENVIRONMENTS. THE TESTS INDICATE THAT DC-6-1104 CAN BE USED AS A SEMI STRUCTURAL ADHESIVE FOR TEMPERATURES NOT EXCEEDING 200 C. WHEN DC-6-1104 IS TO BE USED FOR BONDING FLEXIBLE SUBSTRATES, THE ABILITY TO CONTROL THE BONDLINE IS LESSENED AND THE CONSEQUENT THICKNESS OF THE ADHESIVE VARIES GIVING RISE TO SCATTER IN PEEL STRENGTH VALUES. HENCE USE OF THE ADHESIVE ON UNSUPPORTED FLEXIBLE SUBSTRATES MUST BE MINIMIZED IF AT ALL POSSIBLE. IT IS NOTED FROM THE RESULTS OF THERMAL AND MECHANICAL TESTING THAT DC-6-1104 CAN BE SUCCESSFULLY EMPLOYED AS A BONDING AGENT BETWEEN -50 C AND 200 C. DC-6-1104 ADHESIVE IS RECOMMENDED FOR SEMI STRUCTURAL ADHESIVE APPLICATIONS ON KAPTON, STAINLESS STEEL, SILVERED AND ALUMINIZED TEFLON AT TEMPERATURES OF UP TO 200 C. (AUTHOR) (U)

AD- 922 801L 11/3 22/2 16/3
SPAR AEROSPACE PRODUCTS LTD MALTON (ONTARIO)

CTS: THERMAL CONTROL SURFACE PROPERTIES
MEASUREMENT. (U)

MAY 73 27P BELL,J. F. ;
REPT. NO. SPAR-R.555
MONITOR: GIDEP 347.65.00.00-CL-01

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DESCRIPTORS: (*SPACECRAFT, COATINGS), (*COATINGS, TEMPERATURE CONTROL), (*SURFACE TEMPERATURE, TEMPERATURE CONTROL), SURFACE PROPERTIES, ABSORPTION(PHYSICAL), EMISSIVITY, HEAT SHIELDS, AIRFRAMES, ALUMINUM, FIBERGLASS, GLASS, LAMINATES, REINFORCED PLASTICS, STAINLESS STEEL, PAINTS, TETRAFLUOROETHYLENE RESINS, GOLD, OPTICAL PROPERTIES (U)
IDENTIFIERS: TEFLON, KAPTON (U)

THIS REPORT LISTS THERMAL CONTROL SURFACE PROPERTIES MEASUREMENTS MADE AT SPAR TO VERIFY THAT ABSORPTIVITY AND EMISSIVITY VALUES OF MATERIALS USED IN THE CTS THERMAL SUBSYSTEM DESIGN ARE IN AGREEMENT WITH ANALYTICAL VALUES USED. COMPARISONS OF MEASURED VALUES ARE IN SUBSTANTIAL AGREEMENT WITH EARLIER ASSUMED VALUES. REPORTED ALSO ARE MEASUREMENTS MADE BY NASA-GSFC ENGINEERING APPLICATIONS BRANCH ON REPRESENTATIVE SAMPLES OF CTS THERMAL CONTROL SAMPLES MOUNTED IN THE SES CHAMBER DURING THERMAL VACUUM TESTING. IT IS CONCLUDED THAT THE MATERIALS USED WILL BE SATISFACTORY FOR THERMAL SUBSYSTEM DESIGNS OF ALL CTS SPACECRAFT MODELS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 907 496L   11/3   13/4   22/2
GOODYEAR AEROSPACE CORP AKRON OHIO

FLIGHT HARDWARE FOR AFML D024 SKYLAB
EXPERIMENT. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
AUG 72   116P   MANNING,LOU ;JURICH,LEO ;
REPT. NO. GER-15695
CONTRACT: F33651-67-C-1380
PROJ: AG-7340
TASK: 734007
MONITOR: AFML   TR-72-221

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DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY;
TEST AND EVALUATION; SEP 72. OTHER REQUESTS FOR
THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE
MATERIALS LAB., ATTN: MBE. WRIGHT-PATTERSON
AFB, OHIO 45433.

DESCRIPTORS: (*COATINGS, CONTAINERS), (*SPACECRAFT
COMPONENTS, SPACE STATIONS), (*CONTAINERS, SPACE
ENVIRONMENTS), FILMS, DISKS, POLYMERS, MOUNTING
BRACKETS, FASTENERS, BAGS, VACUUM APPARATUS, OPTICAL
EQUIPMENT, PLASTICS, SYNTHETIC RUBBER, SEALS,
ENVIRONMENTAL TESTS, MECHANICAL DRAWINGS, WEIGHT,
EXTRAVEHICULAR ACTIVITY, HUMAN FACTORS ENGINEERING,
COATINGS, THERMAL PROPERTIES, TEMPERATURE CONTROL (U)
IDENTIFIERS: SKYLAB PROJECT (U)

THE OBJECTIVE OF THIS STUDY IS TO DESIGN,
FABRICATE, TEST, QUALIFY AND DELIVER TO THE AFML/
MBE, THE FLIGHT QUALIFIED D024 EXPERIMENTAL
FLIGHT AND BACKUP HARDWARE REQUIRED FO LAUNCH AND
RECOVER TWO DUPLICATE SETS OF THERMAL CONTROL
COATINGS SAMPLE TRAYS IN VACUUM SEALED CONTAINERS.
EACH TRAY WAS TO CONTAIN 36 INDIVIDUALLY COATED
SAMPLE BUTTONS. MOUNTING PLATES FOR THESE TRAYS TO
BE ATTACHED TO THE SKYLAB INTERFACE WERE ALSO
PROVIDED. (P.S.-PL) (U)

AD- 907 411L   20/13   22/2   5/2
LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF

CONTAMINATION AND DEGRADATION OF THERMAL
CONTROL AND OPTICAL SURFACES: AN
ANNOTATED BIBLIOGRAPHY.   (U)

DESCRIPTIVE NOTE: LITERATURE SEARCH 1971-1972,
JAN 73   100P   ABBOTT,HELEN M. ;
REPT. NO. LMSC-LS-73-1

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DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY.
OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO
LOCKHEED MISSILES AND SPACE CO. ATTN:
TECHNICAL INFORMATION CENTER. PALO ALTO, CALIF.
94304.

DESCRIPTORS: (*TEMPERATURE CONTROL,
SATELLITES(ARTIFICIAL)), (*OPTICAL MATERIALS,
BIBLIOGRAPHIES), SURFACE PROPERTIES, DEGRADATION,
CONTAMINATION, THERMAL INSULATION, THERMAL CONDUCTIVITY,
OPTICAL COATINGS, REFLECTIVITY, FINISHES   (U)
IDENTIFIERS: *OPTICAL SURFACES, *THERMAL CONTROL
COATINGS   (U)

THIS COMPILATION CONTAINS SELECTED REFERENCES
OBTAINED FROM A LITERATURE SEARCH FOR INFORMATION
PERTAINING TO THE PROBLEMS OF CONTAMINATION AND
DEGRADATION OF THERMAL CONTROL OR OPTICAL SURFACES OF
ORBITING VEHICLES. INCLUDED ARE THEORETICAL
STUDIES, FLIGHT AND LABORATORY DATA. THE ABSTRACTS
ARE ARRANGED ALPHABETICALLY BY AUTHOR OR TITLE AND
REPRESENT A COVERAGE OF THE 1971-1972 LITERATURE.
MACHINE SEARCHES OF THE NASA AND DDC FILES WERE
REVIEWED. AN AUTHOR, CORPORATE SOURCE AND A SUBJECT
INDEX HAVE BEEN INCLUDED TO ASSIST IN LOCATING
SPECIFIC DATA WHENEVER THE NEED OCCURS.
(AUTHOR)   (U)

AD-B019 292L 22/2 11/3 20/3
GENERAL ELECTRIC CO PHILADELPHIA PA SPACE DIV

CONDUCTIVE COATINGS FOR SATELLITES. (U)

DESCRIPTIVE NOTE: FINAL REPT. 15 MAY 75-30 JUN 76,
DEC 76 89P EAGLES,ALLEN E. ;BELANGER,
VICTOR J. ;
REPT. NO. 76SDS-4275
CONTRACT: F33615-75-C-5267
PROJ: 7340
TASK: 07
MONITOR: AFML TR-76-233

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DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY;
TEST AND EVALUATION; DEC 76. OTHER REQUESTS FOR
THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE
MATERIALS LAB., ATTN: MBE. WRIGHT-PATTERSON
AFB, OHIO 45433.

DESCRIPTORS: *SILICON DIOXIDE, *THERMAL INSULATION,
*CERAMIC COATINGS, *SYNCHRONOUS SATELLITES,
*ELECTROSTATIC CHARGE, CONTROL, PROTECTIVE
COATINGS, SPACE TECHNOLOGY, ELECTRICAL PROPERTIES,
OPTICAL PROPERTIES, CERAMIC FIBERS, SECONDARY
EMISSION, SIZING, REMOVAL, TEST METHODS (U)
IDENTIFIERS: COATINGS, WUAFML73400772,
PE62102F (U)

HIGH PURITY SILICA FABRICS HAVE BEEN PROPOSED FOR
USE AS A MATERIAL TO CONTROL THE EFFECTS OF
ELECTROSTATIC CHARGING OF SATELLITES AT SYNCHRONOUS
ALTITUDES. THESE MATERIALS HAVE EXHIBITED VERY
QUIET BEHAVIOR WHEN PLACED IN SIMULATED CHARGING
ENVIRONMENTS AS OPPOSED TO OTHER DIELECTRICS USED FOR
PASSIVE THERMAL CONTROL WHICH EXHIBIT VARYING DEGREES
OF ELECTRICAL ARCING. SECONDARY EMISSION
CONDUCTIVITY IS PROPOSED AS A MECHANISM FOR THIS
SUPERIOR BEHAVIOR. STUDIES INDICATED THAT THE ONLY
MODIFICATION NEEDED WITH THIS MATERIAL TO ENABLE
UTILIZATION AS A STATIC CHARGE CONTROL SURFACE IS THE
REMOVAL OF AN ORGANIC SIZE NEEDED IN THE
MANUFACTURING PROCESS. THIS SIZE ACTED TO INHIBIT
SECONDARY EMISSION OF THE SILICA FIBERS; HOWEVER,
THIS CLEANING WAS ALSO REQUIRED TO ENHANCE UV
STABILITY OF THE FABRIC FOR ANY SPACE APPLICATION.
DURING THE PERFORMANCE OF THE CONTRACT, EFFORTS
WERE ALSO DIRECTED TOWARD METHODS OF ENVIRONMENT
SIMULATION AND DEFINITION OF TEST METHODS REQUIRED TO
ANALYZE BEHAVIOR OF MATERIALS PROPOSED FOR USE IN THE
GEOSYNCHRONOUS ORBIT ENVIRONMENT. DESIGN OF (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL508

AD-B019 335L   22/2
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

INSITU SPECTRAL REFLECTANCE MEASUREMENT OF
D024 SKYLAB SAMPLE MATERIALS. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
FEB 77   141P   WINN,R. A. ;DEWITT,D. P.
;
REPT. NO. AFML-TR-76-199
PROJ: 2422, 7340
TASK: 01, 07

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DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; OCT 76. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE MATERIALS LAB., ATTN: MBE. WRIGHT-PATTERSON AFB, OHIO 45433.

DESCRIPTORS: *SPACECRAFT, *TEMPERATURE CONTROL, *COATINGS, REFLECTANCE, INFRARED RADIATION, SPACE STATIONS, SKYLAB, SPACE ENVIRONMENTS, SPECTRUM ANALYSIS, REFLECTOMETERS, MIRRORS, INTERFEROMETRY, SPECTROPHOTOMETERS (U)
IDENTIFIERS: WUAFML24220101, WUAFML73400777, PE62102F (U)

A MULTIPURPOSE REFLECTOMETER FACILITY WITH THE CAPABILITY FOR EXPOSURE OF THE SAMPLE TO SEVERAL ENVIRONMENTAL EFFECTS AND SEQUENTIAL INSITU SPECTRAL REFLECTANCE MEASUREMENT WAS DEVELOPED FOR STUDY OF THE D024 SKYLAB SAMPLE MATERIALS. FEATURES OF THE FACILITY ARE FIRST DESCRIBED AND THE PERFORMANCE OF THE HEMI-ELLIPSOIDAL MIRROR REFLECTOMETER (HEMR) SUBSYSTEM IS EVALUATED. RESULTS ON SELECTED MATERIALS IN THE REGION 0.3 TO 10 MICROMETERS ARE INTERCOMPARED WITH THREE OTHER REFLECTANCE MEASUREMENT METHODS USED IN AFML STUDIES INCLUDING: THE HOHLRAUM REFLECTOMETER, INFRARED INTEGRATING SPHERE REFLECTOMETER USING THE CONVENTIONAL DISPERSION TECHNIQUE, AND AN INTERFEROMETER-TYPE INTEGRATING SPHERE SPECTROPHOTOMETER. BASED UPON THIS INTERCOMPARISON STUDY, THE RESULTS OF THE MEASUREMENTS MADE ON THE D024 SAMPLE MATERIALS IN THE INSITU PRE- AND POST-EXPOSURE CONDITIONS CAN BE EVALUATED. THE CONCLUSIONS REACHED ARE THAT ERRORS EXISTED IN THE CONFIGURATION OF THE HEMR AND THAT RESULTS OF MEASUREMENTS MADE USING THIS INSTRUMENTATION ARE INCONCLUSIVE AT THIS TIME. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 819 193 13/1 13/9 20/13
ROCKETDYNE CANOGA PARK CALIF

INVESTIGATION OF A MOVING BELT RADIATOR. (U)

DESCRIPTIVE NOTE: FINAL REPT. 1 MAY 65-1 MAY 67,
AUG 67 313P SPEEDS,J. A. ;DULGEROFF,C.
R. ;JOHNSON,W. K. ;JORTNER,J. ;MADDOX,J.
P. ;
REPT. NO. R-7101
CONTRACT: AF 33(615)-2813
PROJ: AF-3145
TASK: 314507
MONITOR: AFAPL TR-67-94

UNCLASSIFIED REPORT

DESCRIPTORS: (*RADIATORS(HEATING AND COOLING), SPACECRAFT), (*POWER TRANSMISSION BELTS, RADIATORS(HEATING AND COOLING)), (*HEAT TRANSFER, POWER TRANSMISSION BELTS), (*ANTIFRICTION BEARINGS, POWER TRANSMISSION BELTS), (*MOLYBDENUM, POWER TRANSMISSION BELTS), VACUUM, HIGH TEMPERATURE, THERMAL CONDUCTIVITY, LUBRICANTS, LIQUID METALS, SURFACE AREA, PYROMETERS, GRAPHITE, TIN COATINGS, MOLYBDENUM COMPOUNDS, SULFIDES, STEEL, TANTALUM, FOILS(MATERIALS), RHENIUM, RHENIUM ALLOYS, TUNGSTEN, TUNGSTEN ALLOYS, THERMOCOUPLES, EXPERIMENTAL DATA (U)
IDENTIFIERS: DRY-FILM LUBRICANTS, POLYETHYLENE TEREPHTHALATE, POLYMERIC FILMS (U)

THIS REPORT COVERS THE 24-MONTH PERIOD OF A CONTINUED RESEARCH PROGRAM ON THE FEASIBILITY OF THE MOVING BELT RADIATOR, A NOVEL CONCEPT FOR THE REJECTION OF WASTE HEAT IN SPACE. THE MAIN CONCERNS OF THE PROGRAM ARE MATERIALS COMPATIBILITY, THERMAL CONDUCTION BETWEEN SURFACES, ANTIFRICTION BEARING OPERATION (AT HIGH TEMPERATURE IN A HIGH VACUUM), AND THE DYNAMIC BEHAVIOR OF THE BELT SYSTEM UNDER SIMULATED IN-FLIGHT CONDITIONS. THESE AREAS WERE INVESTIGATED IN FOUR PHASES OF THE PROGRAM. PHASE 1, LONG-DURATION THERMAL AND FLEXURAL TESTS, SHOWED THAT HIGHER CONTACT CONDUCTANCES (6000 BTU/HR-SQ FT-F) THAN REQUIRED FOR A BELT RADIATOR SYSTEM CAN BE OBTAINED WITH A MOLYBDENUM BELT, MOLYBDENUM DRUM, AND LIQUID TIN INTERFACE. A 1,000,000 CONTACT-CYCLE TEST DEMONSTRATED THE DURABILITY AND COMPATIBILITY OF THIS COMBINATION OF MATERIALS. PHASE 2, SMALL-SCALE MODEL MOVING BELT EXPERIMENTS WERE USED TO MEASURE CONTACT CONDUCTANCES (UP TO 2240 BTU/HR- (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 831 624L   22/2   21/2
ARNOLD ENGINEERING DEVELOPMENT CENTER ARNOLD AIR FORCE
STATION TENN

EFFECT OF CONTAMINATION ON SPACECRAFT SURFACES
EXPOSED TO ROCKET EXHAUSTS.   (U)

DESCRIPTIVE NOTE: FINAL REPT. 13 APR-4 AUG 67,
APR 68   58P   BURCH,B. A. ;
REPT. NO. AEDC-TR-68-23
CONTRACT: AF 40(600)-1200

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DISTRIBUTION: USGO: OTHERS TO DEPARTMENT OF THE
AIR FORCE, ATTN: SAFSL-6A. LOS ANGELES
AIR FORCE STATION, CALIF. 90045.
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH ARO,
INC., TULLAHOMA, TENN.

DESCRIPTORS: (*SPACECRAFT, *EXHAUST GASES), (*AIRFRAMES,
CONTAMINATION), SURFACE PROPERTIES, SPACE SIMULATION
CHAMBERS, MANNED SPACECRAFT, LIGHT TRANSMISSION,
REFLECTIVITY, SPECTROPHOTOMETERS, HYPERGOLIC ROCKET
PROPELLANTS, HYPERGOLIC IGNITION, THERMAL STABILITY,
CORROSION, HIGH ALTITUDE   (U)
IDENTIFIERS: GRAPHS(CHARTS), PLUMES(RADIATION),
PROTECTIVE COATINGS   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 830 980 11/3 22/2
LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF

PRODUCTION OF HIGH PURITY THERMAL CONTROL COATINGS. (U)

DESCRIPTIVE NOTE: FINAL REPT. 1 JUN 66-30 FEB 68,
APR 68 200P BAILIN,LIONEL J. ;
CONTRACT: AF 33(615)-5132
MONITOR: AFML TR-68-70

UNCLASSIFIED REPORT

DESCRIPTORS: (*SPACECRAFT, TEMPERATURE CONTROL), (*COATINGS, PRODUCTION), PIGMENTS, SILICATES, ZIRCONIUM OXIDES, SILICON DIOXIDE, LITHIUM COMPOUNDS, ALUMINUM COMPOUNDS, SYNTHESIS(CHEMISTRY), OPTIMIZATION, PURIFICATION, IMPURITIES, BINDERS, POTASSIUM COMPOUNDS, ADHESION, SPRAYS, SOLAR RADIATION, STABILITY, DOPING, SUBSTRATES (U)
IDENTIFIERS: LITHIUM ALUMINOSILICATES, POTASSIUM SILICATE, *PROTECTIVE COATINGS, *THERMAL CONTROL COATINGS (U)

METHODS, PROCESS CONTROLS, AND EQUIPMENT HAVE BEEN DEVELOPED FOR PREPARING HIGH PURITY INORGANIC-BASED THERMAL CONTROL COATINGS FOR SPACECRAFT. TWO PIGMENTS, ZRO2.SIO2 AND LIALSIO4, HAVE BEEN SYNTHESIZED IN THE LABORATORY, OPTIMIZED, AND PRODUCED IN MULTIPOUND QUANTITIES. THE EFFECTS OF IONIC IMPURITIES, SYNTHESIS, AND PIGMENT PURIFICATION PARAMETERS ON THE SPACE RADIATION STABILITY OF THE PIGMENTS AND PIGMENT-POTASSIUM SILICATE BINDER SYSTEMS HAVE BEEN STUDIED IN DETAIL. OPTIMIZATION OF THE PIGMENT-POTASSIUM SILICATE MATRIX FOR PREPARATION OF GALLON QUANTITIES HAS BEEN CARRIED OUT. FORMULATION OF THESE QUANTITIES IS NOW ROUTINE. APPLICATION BY SPRAY AND DRAWDOWN TECHNIQUES FOR A VARIETY OF ALUMINUM AND TITANIUM SPACE VEHICULAR SHAPES AND SIZES HAS BEEN SUCCESSFUL WITH NO CRACKING OR LOSS OF ADHESION. COATING PREPARATION AND DEPOSITION METHODS HAVE EVOLVED TO PRODUCE INORGANIC COATINGS OF MINIMAL OPTICAL AND PHYSICAL CHANGES IN LABORATORY-SIMULATED SPACE RADIATION AND VACUUM ENVIRONMENTS. THE POTENTIAL FOR EFFECTIVELY COATING LARGE AND COMPLEX SHAPES AND STRUCTURES WITH A HIGH DEGREE OF REPRODUCIBILITY AND RELIABILITY HAS BEEN DEMONSTRATED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 830 351 11/3 11/6
BATTELLE MEMORIAL INST COLUMBUS OHIO DEFENSE METALS
INFORMATION CENTER

REVIEW OF RECENT DEVELOPMENTS: OXIDATION-RESISTANT
COATINGS FOR REFRACTORY METALS, (U)

APR 68 2P ALLEN,B. C. ;

UNCLASSIFIED REPORT

DESCRIPTORS: (*REFRACTORY METAL ALLOYS, *COATINGS),
(*CORROSION INHIBITION, COATINGS), NIOBIUM ALLOYS,
CHROMIUM ALLOYS, DIODES, THERMIONIC EMISSION,
SPACECRAFT, REVIEWS (U)
IDENTIFIERS: *CORROSION-RESISTANT COATINGS (U)

BRIEF SUMMARIES ARE GIVEN OF RECENT ADVANCES IN
COATING DEVELOPMENT FOR NIOBIUM AND CHROMIUM ALLOYS.
CONSIDERATION IS ALSO GIVEN TO COATING PROTECTION
FOR THERMIONIC DIODES AND TO SPACECRAFT
APPLICATIONS. (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 825 943L   11/3
LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

TEMPERATURE CONTROL COATINGS FOR CRYOGENIC
TEMPERATURE SUBSTRATES.   (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. 1 JUL 66-7 JUL
67,
NOV 67   106P   BREUCH,RONALD A. ;BELL,
GEORGE A. ;DOUGLAS,N. JOHN ;
CONTRACT: AF 33(615)-5066
PROJ: AF-7340, AF-4056
TASK: 734007, 405601
MONITOR: AFML   TR-66-10-PT-2

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DISTRIBUTION: DOD ONLY: OTHERS TO AIR FORCE
MATERIALS LAB., ATTN: MANE. WRIGHT-
PATTERSON AFB, OHIO 45433.
SUPPLEMENTARY NOTE: SEE ALSO PART 1, AD-483
227L.

DESCRIPTORS: (*COATINGS, *CRYOGENICS), TEMPERATURE
CONTROL, SUBSTRATES, SPACE ENVIRONMENTS, TITANIUM
COMPOUNDS, OXIDES, SILICON, ALUMINUM COMPOUNDS, BARRIER
COATINGS, SOLAR RADIATION, THERMAL RADIATION, PROTONS,
OPTICAL PROPERTIES, LITHIUM COMPOUNDS, POTASSIUM
COMPOUNDS, THICKNESS, ELECTRONS, CALORIMETRY,
INSTRUMENTATION   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 825 348L 22/2 13/1 11/3
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

ALTERNATIVE WHITE THERMAL CONTROL SURFACES FOR THE
UK3 SATELLITE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
MAR 67 23P PORTER,J. ;
REPT. NO. RAE-TR-67055

UNCLASSIFIED REPORT
DISTRIBUTION: DOD AND DOD CONTRACTORS ONLY:
OTHERS TO BRITISH MINISTRY OF AVIATION SUPPLY VIA
THE APPROPRIATE CHANNEL.

DESCRIPTORS: (*SATELLITES(ARTIFICIAL), *TEMPERATURE
CONTROL), (*PLASTIC PAINTS, SURFACE TEMPERATURE),
THERMAL RADIATION, HEAT TRANSFER, COATINGS,
SPECIFICATIONS, REFLECTORS, ZINC COMPOUNDS, OXIDES,
POTASSIUM COMPOUNDS, SILICATES, ULTRAVIOLET RADIATION,
DAMAGE, RADIATION EFFECTS, METAL COATINGS, REFLECTION,
GREAT BRITAIN, SOLAR RADIATION (U)
IDENTIFIERS: *UK-3 SATELLITE (U)

THIS REPORT DISCUSSES THE SPECIFICATION AND TESTING
OF WHITE THERMAL CONTROL SURFACES FOR THE UK3
SATELLITE. THE SOLUTION PROPOSED UTILISES A UNIQUE
SCHEME OF A GOOD MECHANICAL WHITE REFLECTOR
OVERCOATED WITH A ZINC OXIDE POTASSIUM SILICATE
MATERIAL WHICH PROTECTS THE UNDERCOAT FROM DAMAGING
ULTRA VIOLET RADIATION AND IS ITSELF NOT
SIGNIFICANTLY AFFECTED BY EXPOSURE TO SUCH RADIATION.
(AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 825 347L 22/2 13/1
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

PRINCIPLES AND TECHNIQUES IN THE PASSIVE THERMAL CONTROL OF SPACECRAFT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
APR 67 62P SEMPLE,E. C. ;
REPT. NO. RAE-TR-67100

UNCLASSIFIED REPORT
DISTRIBUTION: DOD AND DOD CONTRACTORS ONLY: OTHERS TO BRITISH MINISTRY OF AVIATION SUPPLY VIA THE APPROPRIATE CHANNEL.

DESCRIPTORS: (*SATELLITES(ARTIFICIAL), *TEMPERATURE CONTROL), PASSIVE SYSTEMS, SURFACE TEMPERATURE, COATINGS, HEAT TRANSFER, THERMAL RADIATION, CONDUCTION(HEAT TRANSFER), PERIODIC VARIATIONS, ALBEDO(ASTRONOMY), SOLAR RADIATION, MATHEMATICAL ANALYSIS, GREAT BRITAIN (U)

THIS REPORT IS AN INTRODUCTORY WORK OUTLINING THE FACTORS WHICH AFFECT THE OPERATING TEMPERATURE OF A SPACECRAFT AND THE TECHNIQUES WHICH MAY BE EMPLOYED TO MINIMISE THE VARIATION OF THIS TEMPERATURE OVER ALL THE CONDITIONS IN WHICH THE SPACECRAFT MAY BE REQUIRED TO OPERATE. IT IS ASSUMED THAT ONLY PASSIVE MEANS OF THERMAL CONTROL MAY BE EMPLOYED, I.E., THAT CONTROL IS AFFECTED SOLELY BY THE APPLICATION OF SELECTED THERMAL COATINGS TO THE SURFACE OF THE SPACECRAFT, AND NOT BY ANY MECHANICAL MEANS INVOLVING THE MOVEMENT OF LOUVRES, FOR EXAMPLE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 819 356L   11/2   11/3   11/6   11/9
DAYTON UNIV OHIO RESEARCH INST

THE EVALUATION OF MATERIALS FOR AEROSPACE
APPLICATIONS.   (U)

DESCRIPTIVE NOTE: SUMMARY REPT. JAN 66-JAN 67,
JUN 67   77P   WURST,JOHN C. ;BERNER,
WILLIAM E. ;CHERRY,JOHN A. ;GERDEMAN,DENNIS
A. ;
CONTRACT: AF 33(615)-1312
PROJ: AF-7381
TASK: 738102
MONITOR: AFML   TR-67-165

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TEST AND EVALUATION; 12 JAN 72. OTHER REQUESTS FOR
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MATERIALS LAB., ATTN: LA. WRIGHT-PATTERSON
AFB, OHIO 45433.

DESCRIPTORS: (*HEAT RESISTANT ALLOYS, AEROSPACE CRAFT),
(*REFRACTORY METAL ALLOYS, AEROSPACE CRAFT), (*CERAMIC
MATERIALS, AEROSPACE CRAFT), (*REINFORCED PLASTICS,
AEROSPACE CRAFT), CERAMIC COATINGS, SILICIDES, ALUMINUM
COMPOUNDS, NICKEL ALLOYS, NIOBIUM ALLOYS, PLASMA JETS,
TEST METHODS, HALOCARBON PLASTICS, PHENOLIC PLASTICS,
NIOBIUM ALLOYS, ROCKET NOZZLES, GRAPHITE, THERMAL
EXPANSION, MODULUS OF ELASTICITY, CORROSION INHIBITION,
(U)CORROSION INHIBITION   (U)
IDENTIFIERS: SUPER ALLOYS   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 818 993L 11/3
AVCO ELECTRONICS DIV TULSA OKLA TULSA OPERATION

EVALUATION OF THERMAL CONTROL COATINGS IN THE SPACE
ENVIRONMENT. (U)

DESCRIPTIVE NOTE: SUMMARY TECHNICAL REPT. 1 MAY 65-31
SEP 66,
MAY 67 80P COOLEY,JAMES A. ;
CONTRACT: AF 33(615)-2798
PROJ: AF-7340
TASK: 734007
MONITOR: AFML TR-67-158

UNCLASSIFIED REPORT
DISTRIBUTION: DOD ONLY: OTHERS TO AIR FORCE
MATERIALS LAB., ATTN: MANE. WRIGHT-PATTERSON
AFB, OHIO 45433.

DESCRIPTORS: (*COATINGS, TEMPERATURE CONTROL),
EQUILIBRIUM(PHYSIOLOGY), SIMULATORS, SPACE ENVIRONMENTS,
ULTRAVIOLET RADIATION, SOLAR RADIATION, ABSORPTION,
DEGRADATION, PROTONS, TEST EQUIPMENT, TITANIUM
COMPOUNDS, OXIDES, ZIRCONIUM COMPOUNDS, ACRYLIC RESINS,
POTASSIUM COMPOUNDS, SILICATES, SILICONES, ALUMINUM,
DAMAGE, RADIATION EFFECTS, BLEACHING AGENTS, ELECTRONS,
DOPING (U)
IDENTIFIERS: NEAR ULTRAVIOLET RADIATION, THERMAL
CONTROL COATINGS (U)

A PROGRAM TO EVALUATE THE CHANGE IN SOLAR
ABSORPTANCE OF SELECTED THERMAL CONTROL COATINGS WHEN
SUBJECTED TO VARIOUS COMBINATIONS OF SIMULATED SPACE
ENVIRONMENTAL COMPONENTS HAS BEEN COMPLETED. THESE
COMPONENTS TO WHICH THE SAMPLES WERE SIMULTANEOUSLY
EXPOSED WERE SOLAR ELECTROMAGNETIC RADIATION,
PROTONS, ULTRA-HIGH VACUUM, AND EQUILIBRIUM
TEMPERATURE. CHANGES IN SOLAR ABSORPTANCE ARE
REPORTED AND DISCUSSED. 'BLEACHING' OF INDUCED
OPTICAL DAMAGE OCCURRED FOR THREE OF THE WHITE
COATINGS TESTED WHEN THEY RETURNED TO ATMOSPHERIC
CONDITIONS. SYNERGISTIC EFFECTS APPARENTLY OCCUR
FOR SOME MATERIALS IN COMBINED ENVIRONMENT.
(AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 903 563L 11/3
MARTIN MARIETTA CORP DENVER COLO DENVER DIV

IMPROVED RADIATION-STABLE THERMAL CONTROL
COATINGS. PART III. (U)

DESCRIPTIVE NOTE: FINAL REPT. 15 MAR 71-15 MAR 72,
MAY 72 107P LILLYWHITE,MALCOLM ;PIZZOLATO,
PHILLIP ;HARKER,R. I. ;
REPT. NO. MCR-72-102
CONTRACT: F33615-71-C-1410
PROJ: AF-7340
TASK: 734007
MONITOR: AFML TR-70-94

UNCLASSIFIED REPORT
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7 DEC 72. OTHER REQUESTS FOR THIS DOCUMENT MUST BE
REFERRED TO DIRECTOR, AIR FORCE MATERIALS LAB.,
ATTN: LME. WRIGHT-PATTERSON AFB, OHIO
45433.
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH
PENNSYLVANIA UNIV., PHILADELPHIA. SEE ALSO PART
2, AD-886 047L.

DESCRIPTORS: (*COATINGS, TEMPERATURE CONTROL), PIGMENTS,
CERAMIC COATINGS, PROTECTIVE TREATMENTS, OPTICAL
PROPERTIES, SYNTHESIS(CHEMISTRY), CRYSTALS, CALCIUM
COMPOUNDS, TITANATES, SILICATES, ALUMINA, SILICON
DIOXIDE, QUARTZ, SPINEL, SOLAR RADIATION, ABSORPTION,
STABILITY, BINDERS, SILICONES, PEROVSKITES, EMISSIVITY,
REFLECTIVITY, PARTICLE SIZE, SPACE ENVIRONMENTS, THERMAL
INSULATION, ELECTROMAGNETIC SHIELDING (U)

CANDIDATE PIGMENTS FOR THERMAL CONTROL COATINGS
WERE SYNTHESIZED BY FOUR METHODS THAT PRODUCED HIGH-
PURITY FINE-PARTICLE MATERIAL. THESE METHODS WERE
CRYOCHEMICAL, HYDROTHERMAL, CONTROLLED DEHYDRATION
SYNTHESIS, AND OXALATE CALCINATION. THESE METHODS
WERE USED TO PREPARE RELATIVELY PURE CRYSTALS OR
CRYSTALLITES WHOSE PARTICLES WERE MAINLY LESS THAN
5.0 MICRONS. THE PIGMENT MATERIALS SYNTHESIZED WERE
SPHENE (CATISIO5), QUARTZ (SIO2),
SPINEL (MGAL2O4), ALUMINA (ALPHA-
AL2O3), AND PEROVSKITE (CATIO3). ALL
MATERIALS WERE EVALUATED IN THE SIMULATED SOLAR
IRRADIANCE ENVIRONMENT. THE BEST FOUR PIGMENTS
BASED ON THESE DATA (CATISIO5, CATIO3,
ALPHA-AL2O3 AND SIO2) WERE FORMULATED
INTO COATINGS USING A DIMETHYL SILICONE BINDER AND A
LOW-SPEED BLENDING DISPERSION TECHNIQUE. THESE
COATINGS WERE EVALUATED IN A SIMULATED SOLAR (U)

AD- 905 277 22/2 13/1
DEUTSCHE GESELLSCHAFT FUER LUFT- UND RAUMFAHRT E V
DARMSTADT (WEST GERMANY)

BERICHT UEBER DIE SITZUNG DES DGLR-
FACHAUSSCHUSSES THERMALTECHNOLOGIE AM 22. JUNI
1971 IN PORZ-WAHN (REPORT ON THE DGLR-
SYMPOSIUM ON THERMAL TECHNOLOGY ON 22 JUNE
1971 AT PORZ-WAHN). (U)

DESCRIPTIVE NOTE: DEUTSCHE LUFT- UND RAUMFAHRT
MITTEILUNG.
DEC 71 69P
REPT. NO. DLR-MITT-71-23

UNCLASSIFIED REPORT
DISTRIBUTION: DDC USERS ONLY.
SUPPLEMENTARY NOTE: TEXT IN GERMAN; SUMMARY AND
REFERENCES IN ENGLISH.

DESCRIPTORS: (*TEMPERATURE CONTROL, *SYMPOSIA),
(*SPACECRAFT, TEMPERATURE CONTROL), SPACE ENVIRONMENTS,
THERMAL CONDUCTIVITY, HEAT TRANSFER, OPTICAL COATINGS,
REFLECTIVITY, ABLATION, ROCKET NOZZLES, THERMAL
INSULATION, PROPELLANT TANKS, CRYOGENICS, MIRRORS,
PIPES, WEST GERMANY (U)
IDENTIFIERS: HEAT PIPES, SECOND SURFACE MIRRORS,
TRANSLATIONS (U)

IN 1970 THE DGLR-PANEL 'THERMALTECHNOLOGIE'
WAS FOUNDED IN STUTTGART IN ORDER TO EXCHANGE
EXPERIENCES IN THE FIELD OF ACTIVE AND PASSIVE
THERMAL CONTROL, OF TEMPERATURE-DEPENDENT PARAMETERS
OF MATERIALS, AND OF METHODS FOR CALCULATION OF
THERMAL MODELS MORE INTENSIVELY. THE FIRST MEETING
OF THE PANEL WAS HELD ON JUNE 22ND, 1971, AT THE
DFVLR RESEARCH CENTRE IN PORZ-WAHN. AT
THE MEETING, PAPERS ON METHODS OF PASSIVE THERMAL
CONTROL, ABOUT NEW DEVELOPMENTS ON HEAT PIPES, AND ON
SPECIAL PROBLEMS OF PROTECTION AGAINST HEAT OR COLD
IN ELEMENTS OF PROPULSION SYSTEMS WERE PRESENTED.
THAT REPORT CONTAINS FIVE PAPERS OF THOSE GIVEN AT
THE MEETING AND ONE SUMMARY OF A PAPER ALREADY
PUBLISHED AS A SEPARATE REPORT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 902 221L   11/9   7/4
HUGHES AIRCRAFT CO CULVER CITY CALIF MATERIALS TECHNOLOGY DEPT

POLYMERIC MATERIALS FOR USE AS BINDERS AND TRANSPARENT FILMS. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. 1 FEB 71-15 MAR 72,
JUL 72   87P   AKAWIE,RICHARD I. ;
REPT. NO. HAC-P72-125
CONTRACT: F33615-71-C-1155
PROJ: AF-7340
MONITOR: AFML   TR-71-62-PT-2

UNCLASSIFIED REPORT
DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; JUN 72. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE MATERIALS LAB., ATTN: LNE. WRIGHT-PATTERSON AFB, OHIO 45433.
SUPPLEMENTARY NOTE: SEE ALSO AD-884 244L.

DESCRIPTORS: (*SILOXANES, COATINGS), (*SILICONE PLASTICS, PLASTIC COATINGS), (*POLYMERS, FILMS), BINDERS, INFRARED RADIATION, SILICON COATINGS, ULTRAVIOLET RADIATION, SPACE ENVIRONMENTS, CURING AGENTS, GAMMA RAYS, CHEMICAL COMPOUNDS, ABSORPTION, SPACECRAFT, TEMPERATURE CONTROL, PURIFICATION, SYNTHESIS(CHEMISTRY), COPOLYMERIZATION, THERMAL STABILITY, LIQUID FILTERS, CHROMATOGRAPHIC ANALYSIS, ALUMINA, FLUORIDES, AMINES, IMIDES, NITROGEN, HETEROCYCLIC COMPOUNDS (U)
IDENTIFIERS: BENZOYL PEROXIDE, CURING, CYCLOTETRASILOXANE/OCTAMETHYL, DIAZABICYCLOOCTANE, DIMETHYLSILOXANE POLYMERS, HEXAMETHYLENETETRAMINE, INFRARED TRANSPARENT FILMS, PROPYLENE HEXAFLUORIDE COPOLYMERS, ULTRAVIOLET TRANSPARENT FILMS, VINYLIDENE FLUORIDE POLYMERS (U)

SIGNIFICANT IMPROVEMENTS HAVE BEEN MADE IN THE ULTRAVIOLET STABILITY OF SILICONE COATINGS. PURIFIED OCTAMETHYLCYCLOTETRASILOXANE WAS CONVERTED TO PURE POLY(DIMETHYLSILOXANE), AND COATINGS MADE FROM THIS POLYMER WERE CURED WITH GAMMA RADIATION OR CHEMICAL REAGENTS. THE CHANGE IN ABSORPTION OF THE GAMMA-CURED COATING UPON ULTRAVIOLET IRRADIATION WAS SIGNIFICANTLY LESS THAN THAT OF ANY PREVIOUSLY PREPARED COATING. AS FAR AS IS KNOWN, THIS IS THE BEST ULTRAVIOLET RADIATION-RESISTANT SILICONE COATING AVAILABLE. THE CHANGE IN ABSORPTION OF THE CHEMICALLY CURED COATING WAS ALMOST THE SAME AS THAT OF THE GAMMA-CURED COATING. IN ADDITION, COMMERCIAL (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 901 408L 11/9 22/2
TRW SPACE TECHNOLOGY LABS REDONDO BEACH CALIF

DESIGN AND CONSTRUCTION OF SAMPLE HOLDERS FOR ORBITAL TEMPERATURE CONTROL COATINGS EXPERIMENT. VOLUME II. CALIBRATION DATA AND DRAWINGS. (U)

DESCRIPTIVE NOTE: TECHNICAL DOCUMENTARY REPT.,
63 23P BEVANS,JERRY T. ;LUEDKE, EDWARD E. ;
CONTRACT: AF 33(657)-11243
PROJ: AF-7340
TASK: 734007
MONITOR: RTD TDR-63-4269-VOL-2

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DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; 7 JUL 72. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE MATERIALS LAB., ATTN: LNE. WRIGHT-PATTERSON AFB. OHIO 45433.
SUPPLEMENTARY NOTE: SEE ALSO VOLUME 1, AD-901 407L.

DESCRIPTORS: (*TEMPERATURE CONTROL, *PLASTIC COATINGS), (*MOUNTING BRACKETS, PLASTIC COATINGS), SPACE CAPSULES, PAYLOAD, TESTS, SCIENTIFIC SATELLITES, ORBITS, ULTRAVIOLET RADIATION, SOLAR RADIATION, DEGRADATION, SPACE ENVIRONMENTS, CALIBRATION, THERMAL PROPERTIES, THERMAL ANALYSIS, THERMAL INSULATION, MECHANICAL DRAWINGS, PAINTS (U)
IDENTIFIERS: *SAMPLE HOLDERS (U)

VOLUME II CONTAINS THE DETAILS OF THE SAMPLE HOLDER CONSTRUCTION, WIRING AND CALIBRATION. THE SAMPLE HOLDERS WERE ASSEMBLED USING AN ALUMINUM JIG FABRICATED FOR THIS PURPOSE. THE SENSOR DISKS WERE PLACED IN THE JIG FOR THE STRINGING AND BONDING OPERATION AND THEN TRANSFERRED TO THE HOLDER. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 901 407L 11/9 22/2
TRW SPACE TECHNOLOGY LABS REDONDO BEACH CALIF

DESIGN AND CONSTRUCTION OF SAMPLE HOLDERS FOR ORBITAL TEMPERATURE CONTROL COATINGS EXPERIMENT. VOLUME I. DESIGN, ANALYSIS, AND TEST RESULTS. (U)

DESCRIPTIVE NOTE: TECHNICAL DOCUMENTARY REPT. JUN-DEC 63,
DEC 63 35P BEVANS,JERRY T. ;LUEDKE, EDWARD E. ;
CONTRACT: AF 33(657)-11243
PROJ: AF-7340
TASK: 734007
MONITOR: RTD TDR-63-4269-VOL-1

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DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; 7 JUL 72. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE MATERIALS LAB., ATTN: LNE. WRIGHT-PATTERSON AFB, OHIO 45433.
SUPPLEMENTARY NOTE: SEE ALSO VOLUME 2, AD-901 408L.

DESCRIPTORS: (*TEMPERATURE CONTROL, *PLASTIC COATINGS), (*MOUNTING BRACKETS, PLASTIC COATINGS), SPACE CAPSULES, PAYLOAD, TESTS, SCIENTIFIC SATELLITES, ORBITS, ULTRAVIOLET RADIATION, SOLAR RADIATION, DEGRADATION, RESISTANCE THERMOMETERS, THERMAL PROPERTIES, THERMAL ANALYSIS, VIBRATION, VACUUM, HUMIDITY, CALIBRATION, SPACE ENVIRONMENTS, THERMAL INSULATION, PAINTS (U)
IDENTIFIERS: *SAMPLE HOLDERS (U)

THIS REPORT DESCRIBES THE DESIGN, PERFORMANCE TESTING, AND FABRICATION OF TWELVE SAMPLE HOLDERS FOR THE INORBIT MEASUREMENT OF THE DEGRADATION OF THERMAL CONTROL MATERIALS. A DISCUSSION OF THE PROBLEM OF REDUCING THE FLIGHT DATA TO DEGRADATION INFORMATION IS ALSO INCLUDED. THE REPORT CONTAINS IN ITS APPENDICES ALL PERTINENT INFORMATION REGARDING THE CHOICE AND CALIBRATION OF THE TEMPERATURE SENSORS, VIBRATION TEST CONDITIONS, PROTOTYPE THERMAL TEST RESULTS, AND THE CALIBRATION TEST RESULTS FOR THE DELIVERED SAMPLE HOLDERS. A COMPLETE SET OF FABRICATION AND ASSEMBLY DRAWINGS ARE GIVEN IN VOLUME II OF THIS REPORT. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 894 544 11/3
DAYTON UNIV OHIO RESEARCH INST

METAL PIGMENTED THERMAL CONTROL COATINGS WITH HIGH RATIOS OF SOLAR ABSORPTANCE TO INFRARED EMITTANCE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. JAN 67-JAN 69,
DEC 71 45P STEVENSON,GARY E. ;
CONTRACT: F33615-69-C-1385
PROJ: AF-7340
TASK: 734007
MONITOR: AFML TR-71-248

UNCLASSIFIED REPORT

DESCRIPTORS: (*PAINTS, TEMPERATURE CONTROL), ABSORPTION, INFRARED RADIATION, SATELLITES(ARTIFICIAL), COATINGS, SPACE ENVIRONMENTS, SOLAR RADIATION, ULTRAVIOLET RADIATION, SIMULATION (U)

THE PURPOSE OF THE PROGRAM WAS TO DEVELOP SPRAYABLE PAINT-TYPE COATINGS WITH VARIABLE SOLAR ABSORPTANCE TO INFRARED EMITTANCE RATIOS GREATER THAN UNITY. EXPLORATORY DEVELOPMENT ON COATING MATERIALS THAT WILL YIELD A FIXED A SUB S/EPSILON SUB N RATIO OVER THE RANGE 0.2 < EPSILON < 0.50 IS DESCRIBED. A VARIETY OF LEAFING METAL PIGMENTED COATINGS WAS DEVELOPED AND PREPARED WHICH GAVE A SUB S/EPSILON SUB N RATIOS GREATER THAN UNITY. THE HIGHEST RATIOS (UP TO 2.5) WERE OBTAINED WITH COPPER PIGMENTED FILMS AFTER THEY WERE OXIDIZED AT ELEVATED TEMPERATURES. SUCH SPECIALLY TREATED AND PREPARED MATERIALS HAVE SHOWN EXCELLENT STABILITY TO ELECTRON AND/OR ULTRAVIOLET IRRADIATION IN A SIMULATED SPACE ENVIRONMENT AND HAVE DEMONSTRATED POTENTIAL FOR USE ON FUTURE SATELLITE SYSTEMS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL508

AD- 894 108   11/3   22/2
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

RARE EARTH OXIDE PIGMENTED THERMAL
CONTROL COATINGS.   (U)

DESCRIPTIVE NOTE: FINAL REPT. AUG 69-OCT 70,
MAR 72   51P   PRINCE,DANIEL E. ;
REPT. NO. AFML-TR-71-246
PROJ: AF-7340
TASK: 734007

UNCLASSIFIED REPORT

DESCRIPTORS: (*COATINGS, TEMPERATURE CONTROL), RARE EARTH ELEMENTS, PIGMENTS, BINDERS, SILICONES, SILICATES, SPACE ENVIRONMENTS, ABSORPTION, REFLECTIVITY, PASSIVE SYSTEMS, SPACECRAFT   (U)
IDENTIFIERS: *THERMAL CONTROL COATINGS   (U)

THE PURPOSE OF THE PROGRAM WAS TO DEVELOP IMPROVED PIGMENTED POLYMERIC AND INORGANIC COATINGS HAVING LOW SOLAR ABSORPTANCE AND HIGH EMITTANCE AND IMPROVED STABILITY TO 'SPACE' RADIATION EFFECTS (VACUUM, ULTRAVIOLET, AND PARTICULATE RADIATION) FOR USE IN THE PASSIVE THERMAL CONTROL OF SPACECRAFT. EFFORTS WERE UNDERTAKEN TO INVESTIGATE THE RADIATION STABILITY OF SELECTED RARE EARTH OXIDE PIGMENTS AND PIGMENTED SILICONE AND SILICATE COATINGS TO A LABORATORY SIMULATED SPACE ENVIRONMENT. ENVIRONMENTAL TESTS OF SILICONE AND SILICATE FORMULATIONS INCLUDED EXPOSURE TO VACUUM-ULTRAVIOLET, VACUUM-ELECTRONS, AND VACUUM-ULTRAVIOLET-ELECTRONS WITH BOTH IN SITU AND NON-IN SITU OPTICAL REFLECTANCE MEASUREMENTS BEING TAKEN. (AUTHOR)   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 886 047L 11/3
MARTIN MARIETTA CORP DENVER COLO DENVER DIV

IMPROVED RADIATION-STABLE THERMAL CONTROL
COATINGS. PART II. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. 1 MAR 70-28 FEB 71,
JUL 71 107P LILLYWHITE,MALCOLM A. ;
PIZZOLATO,PHILIP J. ;
REPT. NO. MCR-70-77-PT-2
CONTRACT: F33615-69-C-1311
PROJ: AF-7340
TASK: 734007
MONITOR: AFML TR-70-94-PT-2

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7 DEC 72. OTHER REQUESTS FOR THIS DOCUMENT MUST BE
REFERRED TO DIRECTOR, AIR FORCE MATERIALS LAB,
ATTN: LNE. WRIGHT-PATTERSON AFB, OHIO
45433.
SUPPLEMENTARY NOTE: SEE ALSO AD-871 822.

DESCRIPTORS: (*CERAMIC COATINGS, SPACE ENVIRONMENTS),
(*REFRACTORY COATINGS, SPACE ENVIRONMENTS), (*PIGMENTS,
SOLAR RADIATION), THERMAL STABILITY,
SYNTHESIS(CHEMISTRY), PURIFICATION, PARTICLE SIZE,
CRYOGENICS, DEHYDRATION, THERMAL INSULATION, CALCIUM
COMPOUNDS, QUARTZ, MAGNESIUM COMPOUNDS, SPINEL, ALUMINA,
ALUMINATES, TITANIUM COMPOUNDS, TITANATES, DIOXIDES,
PEROVSKITES, SILICON DIOXIDE, SILICON CARBIDES, BINDERS,
DAMAGE, RADIATION EFFECTS, SILICONE PLASTICS, CHEMICAL
MILLING, THERMOCHEMISTRY (U)
IDENTIFIERS: ALPHA ALLOTROPIC FORMS, ALUMINUM
MAGNESIUM OXIDE SPINEL, ALUMINA, CALCIUM SILICON
TITANIUM OXIDE, CALCIUM TITANATE, CRYSTALLITES,
CRYOCHEMICAL SYNTHESIS, DEHYDRATION SYNTHESIS,
HYDROTHERMAL SYNTHESIS, SPHENE PIGMENTS,
THERMOPHYSICS, TITANIUM(IV) OXIDE, VAPOR PHAS (U)

CANDIDATE PIGMENTS FOR THERMAL CONTROL COATINGS
WERE SYNTHESIZED BY FOUR METHODS WHICH PRODUCED HIGH
PURITY, FINE PARTICLE MATERIAL. THESE METHODS WERE
CRYOCHEMICAL, HYDROTHERMAL, VAPOR PHASE AND
CONTROLLED DEHYDRATION SYNTHESIS. THESE METHODS
WERE USED TO PREPARE RELATIVELY-PURE CRYSTALS OR
CRYSTALLITES WHOSE PARTICLES WERE MAINLY LESS THAN
5.0 MICRON. THE PIGMENT MATERIALS SYNTHESIZED WERE.
SPHENE (CATISIO5), QUARTZ (SIO2),
SPINEL (MGAL2O4), -AL2O3, TIO2,
PEROVSKITE (CATIO3), SIC. ALL MATERIALS
EXCEPT CATIO AND SIC WERE EVALUATED IN THE (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 876 374 21/9.2 21/2 22/2
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

EFFECTS OF A BIPROPELLANT ATTITUDE CONTROL ROCKET PLUME ON OPTICAL WINDOWS AND A THERMAL CONTROL PAINT. (U)

DESCRIPTIVE NOTE: SUMMARY REPT. SEP 69-JUN 70,
AUG 70 79P WINN,ROBERT A. ;
REPT. NO. AFML-TR-70-204
PROJ: AF-7360, AF-632A00DRI
TASK: 736001

UNCLASSIFIED REPORT

DESCRIPTORS: (*COMBUSTION PRODUCTS, DAMAGE ASSESSMENT), (*ATTITUDE CONTROL SYSTEMS, COMBUSTION), (*MANNED SPACECRAFT, THERMAL INSULATION), OPTICAL GLASS, PAINTS, THERMAL PROPERTIES, EMISSIVITY, OPTICAL PROPERTIES, DEGRADATION, THIRD STAGE ENGINES (U)
IDENTIFIERS: ROCKET EXHAUST, TITAN 3, TRANSTAGE MOTORS (U)

THIS TECHNICAL REPORT PRESENTS THE RESULTS OF WORK PERFORMED IN SUPPORT OF THE AIR FORCE ROCKET PROPULSION LABORATORY'S BIPROPELLANT ATTITUDE CONTROL ROCKET (ACR) PLUME CONTAMINATION INVESTIGATION WHICH WAS REQUESTED BY THE SAMSO TITAN TRANSTAGE OFFICE. SPECTRAL TRANSMITTANCE MEASUREMENTS WERE MADE ON OPTICAL GLASS SAMPLES BEFORE AND AFTER EXPOSURE TO THE EXHAUST PLUME OF A BIPROPELLANT ATTITUDE CONTROL ROCKET. SPECTRAL REFLECTANCE MEASUREMENTS WERE MADE ON THERMAL CONTROL PAINT SAMPLES BEFORE AND AFTER EXPOSURE TO THE SAME ENVIRONMENT. CURVES ARE PRESENTED FOR THE SPECTRAL TRANSMITTANCE MEASUREMENTS AND THE SPECTRAL REFLECTANCE MEASUREMENTS, OVER THE SPECTRAL RANGE OF 0.25 TO 2.5 MICRONS, OF THE RESPECTIVE SAMPLES BEFORE AND AFTER EXPOSURE TO THE ACR PLUME. PHOTOGRAPHS OF THE FRONT SURFACES OF ALL THE OPTICAL SAMPLES SUBMITTED FOR 'POST-EXPOSURE' MEASUREMENT ARE INCLUDED TO SHOW SOME OF THE VISUAL EFFECTS OF EXPOSURE. DETERMINATIONS OF THE SOLAR ABSORPTANCE/TOTAL NORMAL EMITTANCE FOR THE THERMAL CONTROL PAINT SAMPLES WERE MADE IN THE NONMETALLIC MATERIALS DIVISION AND THE RESULTANT DATA ARE INCLUDED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 876 012L   11/3   22/2
AVCO CORP TULSA OKLA INSTRUMENT DIV

RESEARCH ON THE COMBINED EFFECTS OF SOLAR AND PARTICULATE RADIATION AND HIGH VACUUM ON THERMAL CONTROL COATINGS. (U)

DESCRIPTIVE NOTE: QUARTERLY PROGRESS REPT. NO. 4, 1 MAR-31 MAY 66,
JUN 66   22P   COOLEY,JAMES A. ;
REPT. NO. AVCO-TR-66-G105-2
CONTRACT: AF 33(615)-2798

UNCLASSIFIED REPORT
DISTRIBUTION: DOD ONLY: OTHERS TO DIRECTOR, AIR FORCE MATERIALS LAB., ATTN: MANE. WRIGHT-PATTERSON AFB, OHIO 45433.

DESCRIPTORS: (*COATINGS, SPACE ENVIRONMENTS), (*DAMAGE, COATINGS), TEMPERATURE CONTROL, SPACECRAFT, ABSORPTION SPECTRA, SPACE SIMULATION CHAMBERS, ALUMINUM COATINGS, COMPOSITE MATERIALS, PLASTIC COATINGS, ACRYLIC RESINS, TITANIUM COMPOUNDS, DIOXIDES, VACUUM, SOLAR RADIATION, CHARGED PARTICLES, ANODIC COATINGS, REFLECTIVITY, PROTON BOMBARDMENT, ELECTRON IRRADIATION, PAINTS, PLASTIC PAINTS, MOLYBDATES, OPTICAL PROPERTIES, SILICATES, ULTRAVIOLET RADIATION, POTASSIUM COMPOUNDS, STRONTIUM COMPOUNDS, ULTRAVIOLET SPECTRA, VISIBLE SPECTRA, INFRARED SPECTRA, (U)INFRARED SPECTRA (U)
IDENTIFIERS: POTASSIUM SILICATE, STRONTIUM MOLYBDATE, THERMAL CONTROL COATINGS, TITANIUM(IV) OXIDE (U)

SAMPLES OF ANODIZED ALUMINUM, TIO2/ACRYLIC, AND SRMOO4/K2SIO3 WERE IRRADIATED IN THE COMBINED ENVIRONMENT SIMULATOR. TEST RESULTS FOR THE FIRST TWO MATERIALS WERE INCONSISTENT. REVERSAL OF DAMAGE WAS NOTED FOR THE SRMOO4 SAMPLES AFTER THREE WEEKS AT ATMOSPHERIC CONDITIONS. (AUTHOR) (U)

AD- 874 375L 11/3 22/2
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

OV1-10 THERMAL CONTROL COATING EXPERIMENT.
PRELIMINARY DATA, (U)

AUG 67 40P BOEBEL,CARL P. ;

UNCLASSIFIED REPORT
DISTRIBUTION: CONTROLLED: ALL REQUESTS TO
DIRECTOR, AIR FORCE MATERIALS LAB., ATTN:
ELASTOMERS AND COATINGS BRANCH. WRIGHT-PATTERSON
AFB, OHIO 45433.
SUPPLEMENTARY NOTE: SEE ALSO AD-864 690.

DESCRIPTORS: (*SATELLITES(ARTIFICIAL), SCIENTIFIC
SATELLITES), (*COATINGS, TEMPERATURE CONTROL), ORBITS,
ORGANIC COATINGS, DEGRADATION, SOLAR RADIATION,
ABSORPTION, DATA PROCESSING, BARRIER COATINGS,
REFLECTIVITY, CALORIMETRY, SAPPHIRE, PAINTS, ACRYLIC
RESINS, ABSORPTION SPECTRA, ANODIC COATINGS, SILICATES,
PLASTIC PAINTS, STRONTIUM COMPOUNDS, PERMANGANATES,
MOLYBDATES, THERMAL RADIATION, ELLIPTICAL ORBIT
TRAJECTORIES, SPACE ENVIRONMENTS, QUARTZ, ALUMINA (U)
IDENTIFIERS: OV1-10 SATELLITE, WHITE COATINGS (U)

THIS REPORT DETAILS THE THERMAL CONTROL COATINGS
AND INITIAL DATA REDUCTION RESULTS FOR THE AIR
FORCE OV1-10 SATELLITE. TWO SAMPLE HOLDERS,
EACH CONTAINING SIX THERMAL CONTROL COATING SAMPLES,
WERE PLACED ON THE SATELLITE. THE OV1-10
SATELLITE WAS LAUNCHED IN DECEMBER OF 1966. THE
DATA OBTAINED INCLUDES DATA FROM OVER TWO HUNDRED
ORBITS COVERING A PERIOD OF APPROXIMATELY SIX MONTHS
AT WHICH TIME THE TAPE RECORDER FAILED. CONTINUING
EXPERIMENTAL DATA IS BEING OBTAINED IN REAL TIME BUT
ONLY DURING PASSES OVER THE TRACKING STATIONS.
PRELIMINARY RESULTS INDICATE THAT ONLY THE WHITE
ORGANIC COATINGS ARE DEGRADING IN THEIR SOLAR
ABSORPTANCE VALUE. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 815 911 11/3
GENERAL DYNAMICS/FORT WORTH TEX NUCLEAR AEROSPACE RESEARCH FACILITY

REFLECTIVITY MEASUREMENTS OF SELECTED THERMAL CONTROL COATINGS IRRADIATED IN HIGH VACUUM. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. 1 OCT 64-1 DEC 66,
JUN 67 124P MCDANIEL,R. H. ;BELL,J.
R. ;WATTIER,J. B. ;
REPT. NO. FZK-326
CONTRACT: AF 29(601)-7077
PROJ: AF-6773
TASK: 677302
MONITOR: AFWL TR-67-22

UNCLASSIFIED REPORT

DESCRIPTORS: (*REFRACTORY COATINGS, REFLECTION), VACUUM, DAMAGE, RADIATION EFFECTS, SPACE ENVIRONMENTS, TITANIUM COMPOUNDS, DIOXIDES, MAGNESIUM COMPOUNDS, IRON COMPOUNDS, SILICONES, SILICATES, OXIDES, SILICON DIOXIDE, ACRYLIC RESINS, SPECTROPHOTOMETERS, DOSIMETERS, HIGH ORBIT TRAJECTORIES, SPACECRAFT, THERMAL RADIATION, BLACKBODY RADIATION, HEAT TRANSFER, EMISSIVITY, SOLAR RADIATION (U)

SEVERAL SPECIMENS OF EACH OF THE FOLLOWING TYPES OF THERMAL-CONTROL COATINGS WERE IRRADIATED FOR 200 HRS AT A POWER LEVEL OF 3 MW BY THE GROUND TEST REACTOR: ACRYLIC TIO2, SILICON ALKYD TIO2, 3M WHITE VELVET, MGO ACRYLIC, FE2O3, M-POLYVINYL BUTYROL TIO2, ZNO/ K2O SIO2, YO2/K2O SIO2, ANODIZED ALUMINUM, AND PV 100. REFLECTANCE VALUES FOR EACH OF THE ABOVE TYPES WERE DETERMINED IN THE 0.3- TO 26.4-MICRO RANGE. THE SPECIMENS WERE IRRADIATED AT THE WEST POSITION OF THE GTR IRRADIATION CELL WHILE IN A HIGH-VACUUM (.000001 TORR) ENVIRONMENT. THE INTEGRATED NEUTRON AND GAMMA DOSES INCIDENT ON THE SPECIMENS WERE 10 TO THE 17TH POWER NVT (E>10 KEV) AND 2 X 10 TO THE 11TH POWER ERGS/GM(C), RESPECTIVELY. AFTER THE APPARATUS CONTAINING THE SPECIMENS HAD DECAYED SUFFICIENTLY FOR SAFE HANDLING, REFLECTANCE MEASUREMENTS WERE MADE. IN THE 0.3- TO 2.2-MICRON RANGE, THE REFLECTANCE WAS MEASURED IN HIGH VACUUM (.000001 TORR) BY USE OF A MGO REFERENCE, A MGO-COATED INTEGRATING SPHERE, A TUNGSTEN SOURCE, A FUSED-SILICA PRISM, AND PHOTOMULTIPLIER AND LEAD SULPHIDE DETECTORS. IN THE 2.2- TO 26.4- MICRON RANGE, THE REFLECTANCE WAS (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 816 115 11/3
LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF

PRODUCTION OF HIGH-PURITY THERMAL CONTROL
COATINGS. (U)

DESCRIPTIVE NOTE: INTERIM ENGINEERING PROGRESS REPT. 1
MAR-31 MAY 67.
MAY 67 48P BAILIN,LIONEL J. ;
CONTRACT: AF 33(615)-5132
PROJ: AF-9-458
MONITOR: RTD IR-9-458(IV)

UNCLASSIFIED REPORT
DISTRIBUTION: NO FOREIGN WITHOUT APPROVAL OF AIR
FORCE MATERIALS LAB., ATTN: MAAM. WRIGHT-
PATTERSON AFB, OHIO 45433.

DESCRIPTORS: (*THERMAL INSULATION, *REFRACTORY
COATINGS), (*SILICATES, REFRACTORY COATINGS),
(*TEMPERATURE CONTROL, REFRACTORY COATINGS), SPACECRAFT,
SYNTHESIS, ZIRCONIUM COMPOUNDS, SILICON COMPOUNDS,
ALUMINUM COMPOUNDS, LITHIUM COMPOUNDS, OXIDES, PIGMENTS,
DOPING, DEGRADATION, OPTICAL PROPERTIES, SPACE
ENVIRONMENTS, ULTRAVIOLET RADIATION, SOLAR WIND,
PROTONS, X RAY DIFFRACTION (U)

ON THE BASIS OF CONTINUED ULTRAVIOLET RADIATION
TESTS, THE STARTING MATERIALS, PIGMENT TREATMENTS,
AND CALCINATION CONDITIONS HAVE BEEN SELECTED FOR
SYNTHESIS OF ZRO2.SIO2 AND LIALSIO4
PIGMENTS TO BE UTILIZED IN PREPARATION OF HIGH-PURITY
SILICATE THERMAL CONTROL COATINGS. REACTOR GRADE,
SULFUR-FREE ZIRCONIA, AND HIGH-PURITY FUSED SILICA
POWDER ARE USED FOR THE ZRO2.SIO2 PIGMENT.
FOR LIALSIO4, THE STARTING COMPONENTS ARE
REAGENT GRADE LI2CO3, AL(OH)3, AND SILICIC
ACID. THE IMPURITY CONTENT OF THE LIALSIO4
IS SIMILAR TO THAT OF THE ZRO2.SIO2 PIGMENT.
X-RAY DIFFRACTION PATTERNS WERE RUN ON
ZRO2.SIO2, FROM WHICH IT WAS DEDUCED THAT THE
ZRO2 COMPONENT WAS MONOCLINIC WITH NO TETRAGONAL
OR CUBIC PHASE PRESENT. THE SILICA REMAINED
AMORPHOUS (NON-CRYSTALLINE) EXCEPT AT 1450 C.
NO ZIRCON, ZRSIO4, WAS FOUND IN ANY OF THE
SAMPLES. DETERMINATION OF THE LATTICE CONSTANTS
AND CELL VOLUMES OF FIVE VARIOUSLY HEAT-TREATED
ZIRCONIA PIGMENTS INDICATED THAT SMALL, BUT
SIGNIFICANT STRUCTURAL CHANGES RESULTED FROM THE HEAT
TREATMENTS, PARTICULARLY ABOVE THE MONOCLINIC-
TETRAGONAL TRANSITION TEMPERATURE. FOR THE DOPING
OF HIGH-PURITY ZIRCONIA WITH METALS, 13 OF A PLANNED(U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 814 856 11/2 13/8
DOUGLAS AIRCRAFT CO INC SANTA MONICA CALIF DONALD W
DOUGLAS LABS

EXPERIMENTAL EVALUATION OF EXPANDED PYROLYTIC
GRAPHITE FOR USE IN SPACE RADIATORS. (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT., 1 MAR 66-28
FEB 67,
MAY 67 95P MADSEN,JACK ;KING,PETER P.
;JOHNSTON,RICHARD P. ;
REPT. NO. DAC-SM-59992
CONTRACT: AF 33(615)-3372
MONITOR: AFAPL TR-67-54

UNCLASSIFIED REPORT

DESCRIPTORS: (*PYROLYTIC GRAPHITE, RADIATORS(HEATING AND COOLING)), (*RADIATORS(HEATING AND COOLING), SPACECRAFT), DENSITY, IMPACT TESTS, METEORS, ARMOR, SIMULATION, BRAZING ALLOYS, HYPERVELOCITY PROJECTILES, COATINGS, SPRAYS, PLASMA JETS, THERMAL CONDUCTIVITY, PIPES, NIOBIUM ALLOYS, ZIRCONIUM ALLOYS, STAINLESS STEEL, SILVER ALLOYS, COPPER ALLOYS, TITANIUM ALLOYS (U)
IDENTIFIERS: STEEL 1050 (M)

EXPANDED PYROLYTIC GRAPHITE WAS FOUND TO BE A SUPERIOR ARMOR-FIN MATERIAL FOR HIGH PERFORMANCE RADIATORS. HYPERVELOCITY IMPACT TESTS WERE PERFORMED FOR MATERIALS WITH DENSITIES FROM 25 TO 80 LB/CU FT. AN OPTIMUM DENSITY OF 40 LB/CU FT WAS FOUND. THE RESULTS SHOWED GOOD ARMOR EFFECTIVENESS AND MATERIAL INTEGRITY. IMPACT TESTS AT 1300 F SHOWED LITTLE DIFFERENCE FROM THOSE AT ROOM TEMPERATURE. A FINAL SERIES OF TUBE-ARMOR-FIN TARGETS WERE TESTED FOR FIN PENETRATION, FIN ROOT PENETRATION, AND DIRECT IMPACT OF A COOLANT TUBE. ALL THREE OBJECTIVES WERE MET. BY EXTRAPOLATION TO A METEOROID CRITERIA THE REQUIRED ARMOR THICKNESS IS ONLY 0.100 INCHES. PLASMA SPRAY TECHNIQUES WERE DEVELOPED TO APPLY BRAZE ALLOYS TO RADIATOR TUBE MATERIALS PREPARATORY TO BONDING TO THE EXPANDED PYROLYTIC GRAPHITE. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 813 766L 21/2 20/4 11/3
NORTH AMERICAN AVIATION INC DOWNEY CALIF SPACE AND
INFORMATION SYSTEMS DIV

ATTITUDE CONTROL ROCKET EXHAUST PLUME EXPERIMENT.
SPECIAL REPORT. (U)

DESCRIPTIVE NOTE: REPT. FOR 28 FEB-28 APR 67,
MAY 67 61P BOUDREAUX,RODNEY A. ;
ETHERIDGE,FREDERICK G. ;
REPT. NO. SID-67-499
CONTRACT: AF 04(611)-11542
PROJ: AF-6753
MONITOR: AFRPL TR-67-90

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DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY;
TEST AND EVALUATION; AUG 71. OTHER REQUESTS FOR
THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE
ROCKET PROPULSION LABORATORY, ATTN: RPPR-
STINFO. EDWARDS AIR FORCE BASE, CALIF. 93523.
SUPPLEMENTARY NOTE: SEE ALSO REPT. NO. SID-67-22 DATED
FEB 67, AD-807 996.

DESCRIPTORS: (*ATTITUDE CONTROL SYSTEMS, *EXHAUST
GASES), (*SPACECRAFT, PROTECTIVE TREATMENTS), SURFACES,
TEMPERATURE CONTROL, PRESSURE, DEGRADATION, STABILITY,
HEAT TRANSFER, ZINC COATINGS, PROPELLANT TANKS, SOLAR
RADIATION, STAINLESS STEEL, THERMOCOUPLES, ELECTRIC
INSULATION, SANDWICH CONSTRUCTION, SANDWICH PANELS,
SPACE PROPULSION, SPACE ENVIRONMENTS, CONFIGURATION,
SPIN STABILIZATION (U)
IDENTIFIERS: APOLLO, PLUMES(RADIATION), STEEL 1050,
SURVEYOR, TETRAFLUOROETHYLENE RESINS (U)

THE OVERALL OBJECTIVE OF THE PROGRAM IS TO PERFORM
SUITABLE IN-FLIGHT EXPERIMENTS IN SPACE TO DETERMINE
THE NATURE AND MAGNITUDE OF THE EXHAUST PLUME
IMPINGEMENT EFFECTS ON SPACECRAFT FUNCTIONAL
SURFACES. THE WORK DISCUSSED IN THIS SPECIAL
REPORT IS RELATED TO DEFINITION OF A SUITABLE SPACE
PROPULSION SYSTEM WHICH WILL FUNCTION AS THE PLUME
SOURCE, CONDUCTING STUDIES RELATED TO THE INTEGRATION
OF THE EXPERIMENT AND THE OV1 VEHICLE, PERFORMING A
THERMAL ANALYSIS ON THE EXPERIMENT AND ASSOCIATED ON-
BOARD EQUIPMENT, AND PLANNING A STABILITY AND CONTROL
STUDY TO ASSURE THAT THE VEHICLE WILL BE ORIENTED IN
SPACE IN A MANNER WHICH WILL PERMIT THE SUCCESSFUL
EXECUTION OF THE EXPERIMENT. THE RESULTS OF THE
STUDY ARE: (1) FLIGHT RATED PROPELLANT
SYSTEMS SUITABLE FOR THE IN-SPACE EXPERIMENT HAVE
BEEN IDENTIFIED. SEVERAL ROCKET ENGINES WITH (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 801 274 11/3
NORTH AMERICAN AVIATION INC LOS ANGELES CALIF

THE ROLE OF EMITTANCE IN REFRACTORY METAL COATING PERFORMANCE: PART I - REVIEW AND ANALYSIS. (U)

DESCRIPTIVE NOTE: SUMMARY TECHNICAL REPT. 1 JUL 65-31 JAN 66 ON PHASE 1,
JAN 66 153P BARTSCH,K. O. ;HUEBNER,A.
;
REPT. NO. NA-66-760-PT-1
CONTRACT: AF 33(615)-3039
PROJ: AF-7312
TASK: 731201
MONITOR: AFML TR-66-55-PT-1

UNCLASSIFIED REPORT

DESCRIPTORS: (*REFRACTORY COATINGS, *EMISSIVITY), (*REFRACTORY METALS, REFRACTORY COATINGS), AEROSPACE CRAFT, ROCKET ENGINES, COOLING, SILICIDES, NIOBIUM ALLOYS, MOLYBDENUM ALLOYS, TIN, ALUMINUM COMPOUNDS, TANTALUM ALLOYS, THERMAL RADIATION, HYPERSONIC FLOW (U)
IDENTIFIERS: MOLYBDENUM ALLOY TZM, NIOBIUM ALLOY CB-752 (U)

THE ROLE OF EMITTANCE WAS REVIEWED FOR THE PURPOSE OF ORIENTING THE PLANNING OF A COMPREHENSIVE PROGRAM TO PROVIDE ACCURATE AND PROPER EMITTANCE DATA FOR THERMAL CALCULATIONS NEEDED IN THE DESIGN OF ADVANCED AEROSPACE VEHICLES AND ENGINES. THE FOLLOWING WAS FOUND: COATED REFRACTORY METALS ARE USED AND ARE PLANNED FOR FUTURE USE ON REENTRY AND HYPERSONIC CRUISE VEHICLES WHICH ARE COOLED ALMOST SOLELY BY THE RADIATION OF HEAT TO SPACE. SPACE ENGINE NOZZLES AND EXTENSIONS FABRICATED OF COATED REFRACTORY METALS MAY BE COOLED TO ADVANTAGE BY RADIATION. EMITTANCE VALUES HAVE A PROFOUND EFFECT ON THE RATE OF HEAT REJECTION, AND THEREBY, ON THE METAL-COATING SYSTEM TEMPERATURE WHICH, IN TURN, CONTROLS COATING LIFE AND METAL STRENGTH. THE EMITTANCE OF A COATED REFRACTORY METAL IS A FUNCTION OF ITS ENVIRONMENT WHICH INCLUDES TEMPERATURE, TIME, PARTIAL PRESSURES OF THE ATMOSPHERIC CONSTITUENTS, AND THE FREE-STREAM VELOCITY OF THE ATMOSPHERE UNDER EXTREME TEMPERATURE CONDITIONS. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 787 508 22/2
JOHNS HOPKINS UNIV SILVER SPRING MD APPLIED PHYSICS LAB

THERMAL DESIGN AND ANALYSIS OF THE GEOS-C SPACECRAFT. (U)

DESCRIPTIVE NOTE: TECHNICAL MEMO.,
MAY 74 93P FOX,HAROLD G. ;
REPT. NO. APL-TG-1248
CONTRACT: N00017-72-C-4401

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: *SCIENTIFIC SATELLITES, *THERMAL INSULATION, HEAT TRANSFER, THERMAL ANALYSIS, TELEMETER SYSTEMS, SATELLITE ATTITUDE, ATTITUDE CONTROL SYSTEMS, COATINGS (U)
IDENTIFIERS: GEOS SATELLITES, GEOS C SATELLITE, *THERMAL COATINGS (U)

THE THERMAL CONTROL OF THE GEOS-A AND GEOS-B SATELLITES DESIGNED AND BUILT BY APL HAS BEEN CONSIDERED SUCCESSFUL. ADDITIONAL VOLUME AND STRUCTURE WERE ADDED TO THE BASIC GEOS-A/B REFERENCE IN ORDER TO ARRIVE AT THE GEOS-C CONFIGURATION. THE INTERIOR OF THE GEOS-C SATELLITE CONSISTS OF A MORE CONDUCTIVE HEAT TRANSFER NETWORK AND THE SPACECRAFT PAYLOAD EXCEEDS 700 POUNDS. IN GOING TO THE GEOS-C CONFIGURATION, IT HAS BEEN NECESSARY TO INCLUDE THE EFFECTS OF THE CHANGES IN ORBIT AND INTERNAL HEAT DISSIPATION PROFILES IN THE THERMAL DESIGN AND ANALYSIS OF THE SPACECRAFT. THE DESIGN AND ANALYSIS PRESENTED IS THAT OF THE ANALYTICAL RESULTS OBTAINED FROM THE THERMAL ANALYTICAL MODEL. TO COMPLETE THE STORY, AN ADDENDUM IS PLANNED TO PRESENT NEW DATA AS THEY BECOME AVAILABLE FROM THE SPACECRAFT THERMAL VACUUM TESTING AND FROM POST-LAUNCH TELEMETRY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 784 223   11/3
TRW SYSTEMS GROUP REDONDO BEACH CALIF

DATA REDUCTION FOR ORBITAL TEMPERATURE CONTROL EXPERIMENT - A COMPUTER PROGRAM AND FLIGHT RESULTS.   (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
APR 67   27P   FRANK,L. E. ;LUEDKE,E. E. ;
CONTRACT: AF 33(615)-2833
PROJ: AF-7340, AF-4056
TASK: 734007, 405601
MONITOR: AFML   TR-67-47

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE:

DESCRIPTORS: *COATINGS, TEMPERATURE CONTROL, DATA REDUCTION, COMPUTER PROGRAMS, EXPERIMENTAL DATA, SATELLITES(ARTIFICIAL), ABSORPTION(PHYSICAL), EMITTANCE   (U)
IDENTIFIERS: OV1-4 SATELLITE, THERMAL CONTROL COATINGS   (U)

THE REPORT SUMMARIZES THE DEVELOPMENT OF A DATA REDUCTION COMPUTER PROGRAM AND THE ANALYSIS OF EXPERIMENTAL DATA ON A THERMAL CONTROL COATINGS EXPERIMENT ON THE AIR FORCE OV1-4 SATELLITE. THE COMPUTER PROGRAM HAS BEEN SUCCESSFULLY USED TO CALCULATE THERMAL RADIATIVE PROPERTIES OF COATINGS PLACED ON TWO SAMPLE HOLDERS ON THE OV1-4 SPACECRAFT. THE SAMPLE HOLDERS WERE DEVELOPED AND BUILT FOR THE AIR FORCE UNDER CONTRACT AF33(657)-11243 AND EACH HOLDS SIX COATING SAMPLES. THE OV1-4 SPACECRAFT WAS LAUNCHED IN MARCH OF 1966 AS A PART OF THE OFFICE OF AEROSPACE RESEARCH, USAF, OVERALL SCIENTIFIC RESEARCH PROGRAM. (AUTHOR)   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 782 093 22/2
AVCO SYSTEMS DIV WILMINGTON MASS

DETERMINATION OF SATELLITE OBSERVABLES.
VOLUME IV. OPTICAL PROPERTIES OF SATELLITE
MATERIALS. (U)

DESCRIPTIVE NOTE: FINAL REPT. 24 APR 72-12 NOV 73,
MAY 74 302P BAIR,M. E. ;CARMER,D. ;
ZUK,D. ;SUITS,G. ;
REPT. NO. AVSD-0085-74-CR-VOL-4
CONTRACT: F04701-72-C-0353
MONITOR: SAMSO TR-73-291-VOL-4

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH
ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN
ARBOR, CONTRACT F04701-72-C-0360.

DESCRIPTORS: *SPACECRAFT COMPONENTS, OPTICAL
PROPERTIES, SOLAR CELLS, TEMPERATURE CONTROL,
MIRRORS, PAINTS, TAPES, ALUMINUM COATINGS,
REFLECTIVITY, EMISSIVITY, SURFACE PROPERTIES,
INFRARED SPECTRA, DATA PROCESSING,
INSTRUMENTATION, MEASUREMENT, GRAPHICS,
SATELLITE TRACKING SYSTEMS (U)

THE OPTICAL PROPERTIES OF SELECTED SATELLITE
SURFACE MATERIALS WERE MEASURED; THESE MATERIALS
INCLUDED SOLAR CELLS, THERMAL CONTROL MIRRORS,
REFLECTIVE TAPE, AND VARIOUS PAINTED SURFACE. ALL
SAMPLES WERE PREPARED USING ACTUAL VEHICLE SUBSTRATES
AND FLIGHT TEST ASSEMBLY PROCEDURES. MEASUREMENT
DATA REPORTED INCLUDE: (1) SPECTRAL
DIRECTIONAL REFLECTANCE AND/OR EMITTANCE OVER THE
UV0.24- TO IR22- MICROMETERS SPECTRAL RANGE;
(2) BIDIRECTIONAL REFLECTANCE AT COHERENT
WAVELENGTHS OF 0.63, 1.06 AND 10.6 MICROMETERS AND A
VISIBLE SOLAR SIMULATION BAND EXTENDING FROM 0.4 TO
0.7 MICROMETERS; AND (3) SURFACE DISTRIBUTION
INFORMATION ON SAMPLES HAVING A SIGNIFICANT SPECULAR
COMPONENT -- GIVEN AS DIRECTION NORMAL ORIENTATION OF
INDIVIDUAL SAMPLE ELEMENTS. INSTRUMENTATION
MEASUREMENT TECHNIQUES ARE DISCUSSED, AND THE
RESULTS, SHOWING SIGNIFICANT SPECULAR RETURNS FROM
SOLAR CELLS, ARE PRESENTED IN TABULAR OR GRAPHICAL
FORMAT. DATA INTERPRETATION AND VARIABILITY ARE
ALSO DISCUSSED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 766 340 11/3 22/2 20/13
QUALITY ASSURANCE DIRECTORATE (MATERIALS) LONDON (ENGLAND)

STABLE WHITE PAINT SYSTEM FOR THE ARIEL III SPACECRAFT, (U)

APR 70 46P RHODES,J. J. K. ;
REPT. NO. QAD(MATS)-146
MONITOR: DRIC BR-24476

UNCLASSIFIED REPORT

DESCRIPTORS: (*PAINTS, THERMAL STABILITY), (*SATELLITES(ARTIFICIAL), THERMAL INSULATION), SOLAR RADIATION, THERMAL ANALYSIS, SILICATES, PROTECTIVE TREATMENTS, STATISTICAL DATA, GREAT BRITAIN (U)

A GENERAL ACCOUNT IS GIVEN OF THE PROBLEM OF MAINTAINING A SUITABLE TEMPERATURE INSIDE AN ORBITING SPACECRAFT BY PROVIDING SURFACES WHICH GIVE THE CORRECT BALANCE BETWEEN SOLAR ABSORPTION AND RADIATION LOSS. THE SURFACES USED IN THE HEAT CONTROL SYSTEM OF UK3 (KNOWN SINCE LAUNCH AS ARIEL 3) ARE DESCRIBED. THESE INCLUDE AN ACRYLIC WHITE PAINT WHICH IS PROVIDED WITH A NOVEL PROTECTION AGAINST ULTRAVIOLET DEGRADATION IN SPACE IN THE FORM OF A ZINC OXIDE/POTASSIUM SILICATE OVERCOATING. AN APPENDED STUDY OF THE TEMPERATURE RECORD IN ORBIT SHOWS THAT THIS OVERCOATING HAS HAD A CONSIDERABLE DEGREE OF SUCCESS AND MAY IN FACT HAVE BEEN COMPLETELY SUCCESSFUL FOR OVER A YEAR IN SPACE. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 760 577 11/3 22/2
HONEYWELL INC MINNEAPOLIS MINN SYSTEMS AND RESEARCH DIV

SOLAR ABSORBER COATING STUDY. (U)

MAY 73 71P PETERSON,RONALD E. ;RAMSEY, JAMES W. ;
REPT. NO. 2810-3011
CONTRACT: F33615-72-C-1689
PROJ: AF-7360
TASK: 736001
MONITOR: AFML TR-73-80

UNCLASSIFIED REPORT

DESCRIPTORS: (*REFRACTORY COATINGS, OPTICAL PROPERTIES), (*SPACECRAFT COMPONENTS, REFRACTORY COATINGS), SUBSTRATES, HEAT FLUX, ALUMINA, MOLYBDENUM, PLATINUM, HIGH TEMPERATURE, OPTICAL COATINGS, REFRIGERATION SYSTEMS, DAMAGE, RADIATION EFFECTS, SOLAR RADIATION, ABSORPTION, THERMAL STABILITY, CRYOGENICS (U)
IDENTIFIERS: LIFE TESTS (U)

THE STUDY HAS EXAMINED SOLAR ABSORBER COATINGS INTENDED FOR USE ON A SOLAR HEAT SOURCE SYSTEM TO PROVIDE THERMAL ENERGY TO DRIVE SPACEBORNE VUILLEUMIER CYCLE CRYOGENIC REFRIGERATORS. THE TESTS HAVE EVALUATED POTENTIAL COATING DURABILITY FOR AN EXPECTED 3 TO 5 YEARS IN SPACE AT AN OPERATING TEMPERATURE OF 1600F. TWO COATINGS, AL2O3-MO-AL2O3 (AMA) AND AL2O3-PT-AL2O3 (APA) WERE TESTED ON FOUR SUBSTRATES: STAINLESS STEEL, INCONEL, TZM AND CB-1 PERCENT ZR. ON STAINLESS STEEL AND INCONEL SUBSTRATES BOTH COATINGS WERE FOUND TO WITHSTAND ONE HOUR VACUUM BAKES UP TO APPROXIMATELY 1700F. AUGER ANALYSIS INDICATED COMPONENTS OF THE INCONEL OR SS HAD DIFFUSED COMPLETELY THROUGH THE COATING AT HIGHER TEMPERATURES. (MODIFIED AUTHOR ABSTRACT) (U)

C-4

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL508

AD- 759 083   11/3   22/2
TRW SYSTEMS GROUP REDONDO BEACH CALIF

DEVELOPMENT OF FLIGHT UNITS FOR THERMAL
CONTROL COATINGS EXPERIMENT.   (U)

DESCRIPTIVE NOTE: FINAL REPT. MAY 71-SEP 72,
OCT 72   145P   LUEDKE,E. E. ;KELLEY,L.
R. ;
REPT. NO. TRW-18595
CONTRACT: F33615-71-C-1448
PROJ: AF-7340
TASK: 734007
MONITOR: AFML   TR-72-233

UNCLASSIFIED REPORT

DESCRIPTORS: (*SATELLITES(ARTIFICIAL), TEMPERATURE CONTROL), (*TEMPERATURE CONTROL, *COATINGS), SPACE ENVIRONMENTS, ENVIRONMENTAL TESTS, SOLAR RADIATION, DAMAGE, RADIATION EFFECTS, HEAT RESISTANT MATERIALS, COMPUTER PROGRAMS, FLIGHT TESTING   (U)
IDENTIFIERS: *THERMAL CONTROL COATINGS   (U)

THE OBJECTIVE OF THE PROGRAM IS TO DESIGN, FABRICATE, AND TEST EXPERIMENTAL FLIGHT PACKAGES CAPABLE OF MEASURING THE LONG TERM DEGRADATION OF SOLAR ABSORPTANCE OF THERMAL CONTROL COATINGS (TCC) IN THE SPACE ENVIRONMENT. USE OF THESE HIGHLY ACCURATE FLIGHT UNITS WILL ALLOW CORRELATION OF THE PERFORMANCE OF EXPERIMENTAL TCC IN THE ACTUAL SPACE ENVIRONMENT WITH THAT EXHIBITED IN LABORATORY IN SITU SIMULATED SPACE ENVIRONMENTS. SIX EXPERIMENT PACKAGES CAPABLE OF TESTING EIGHT TCC SURFACES EACH ON AN ORBITING SPACECRAFT HAVE BEEN DEVELOPED. EACH PACKAGE WEIGHS 430 GRAMS, CONSUMES 350 MW OF POWER, OPERATES FROM 28 PLUS OR MINUS 5V, AND PROVIDES A 0-5 V TELEMETRY OUTPUT WITH AN OVERALL ACCURACY OF PLUS OR MINUS 1F. A PROTOTYPE FLIGHT UNIT SUCCESSFULLY PASSED THERMAL CYCLING, SHOCK, VIBRATION AND HUMIDITY TEST QUALIFICATIONS. (AUTHOR)   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 874 230L 11/3 20/6 20/12
LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF AEROSPACE SCIENCES LAB

TEMPERATURE CONTROL COATINGS FOR CRYOGENIC TEMPERATURE SUBSTRATES. (U)

DESCRIPTIVE NOTE: QUARTERLY PROGRESS REPT. NO. 2, 1 OCT-30 DEC 66.
DEC 66 28P
REPT. NO. LMSC-TP-2227
CONTRACT: AF 33(615)-5066

UNCLASSIFIED REPORT
DISTRIBUTION: CONTROLLED: ALL REQUESTS TO DIRECTOR, AIR FORCE MATERIALS LAB., ATTN: MANE. WRIGHT-PATTERSON AFB, OHIO 45433.

DESCRIPTORS: (*BARRIER COATINGS, *TEMPERATURE CONTROL), OPTICAL PROPERTIES, SUBSTRATES, OPTICAL COATINGS, DAMAGE, RADIATION EFFECTS, PROTON BOMBARDMENT, TARGET ANGLE, VACUUM, CRYOGENICS, LOW TEMPERATURE, ULTRAVIOLET RADIATION, SPACE ENVIRONMENTS, ABSORPTION, REFLECTIVITY, EMISSIVITY, ALUMINA, LITHIUM COMPOUNDS, POTASSIUM COMPOUNDS, SILICATES, BLACKBODY RADIATION, CALIBRATION, COLOR CENTERS, REFRACTION (U)
IDENTIFIERS: ABSORPTANCE, EMITTANCE, REFLECTANCE, *THERMAL CONTROL COATINGS (U)

RESEARCH ON THE OPTICAL PROPERTIES OF THERMAL CONTROL COATINGS FOR CRYOGENIC TEMPERATURE SUBSTRATES IS REPORTED. PROTON ENERGY DEPENDENCE OF OPTICAL DAMAGE EXPERIMENTS HAVE BEEN PERFORMED ON THE SIX CANDIDATE COATINGS, PROTON ENERGIES OF 176, 466, AND 987 KEV WERE USED WITH TOTAL INTEGRATED FLUXES OF UP TO 5 X 10 TO THE 15TH POWER RHO/SQ CM. PROTON ANGLES OF INCIDENCE TO THE TARGETS WERE CONTROLLED AT 19.5, 32.5, 45.5 AND 90 DEGREES. TARGET TEMPERATURES WERE APPROXIMATELY 11 C AND THE WORKING PRESSURE IN THE EXPOSURE CHAMBER WAS < 3 X 10 TO THE MINUS 7TH POWER TORR. A SUMMARY OF THE EXPOSURE DATA IS PRESENTED. FOR A NEARLY CONSTANT INTEGRATED FLUX AN INCREASE IN PROTON ENERGY RESULTED IN AN INCREASE IN THE ABSORPTION OF THE COATINGS FOR THE PRIMARY SOLAR ELECTROMAGNETIC SPECTRUM. TWO COATINGS, THE OSR AND THE BARRIER ANODIZE, WERE ESSENTIALLY UNDAMAGED. LOW TEMPERATURE EMITTANCE MEASUREMENTS ON THREE OF THE COATINGS OVER THE TEMPERATURE INTERVAL 170 TO 300 K ARE PRESENTED. INFORMATION AND MODIFICATIONS TO THE IN SITU BIDIRECTIONAL REFLECTANCE MEASUREMENT, AND A MODIFIED MEASUREMENT PROCEDURE IS ALSO PRESENTED. (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 873 149L   11/3
BOEING CO SEATTLE WASH

ULTRAVIOLET AND ELECTRON RADIATION EFFECTS ON
REFLECTANCE AND EMITTANCE PROPERTIES OF
THERMAL CONTROL COATINGS.   (U)

DESCRIPTIVE NOTE: FINAL REPT. 16 JAN 69-15 APR 70,
JUL 70   155P   FOGDALL,LAWRENCE B. ;
CANNADAY,SHERIDAN S. ;
CONTRACT: F33615-69-C-1238
PROJ: AF-7340
TASK: 734007
MONITOR: AFML   TR-70-156

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DISTRIBUTION: USGO; OTHERS TO DIRECTOR, AIR
FORCE MATERIALS LAB., ATTN: MANE. WRIGHT-
PATTERSON AFB, OHIO 45433.

DESCRIPTORS: (*COATINGS, TEMPERATURE CONTROL),
SPACECRAFT, DAMAGE, RADIATION EFFECTS, ELECTRON
IRRADIATION, ULTRAVIOLET RADIATION, REFLECTIVITY,
EMISSIVITY   (U)
IDENTIFIERS: *THERMAL CONTROL COATINGS   (U)

THE EFFECTS OF 20-KEV ELECTRONS AND ULTRAVIOLET
RADIATION, SEPARATELY AND COMBINED ON THE REFLECTANCE
AND EMITTANCE PROPERTIES OF 20-TYPES OF THERMAL
CONTROL MATERIALS HAVE BEEN INVESTIGATED
EXPERIMENTALLY IN VACUUM. MATERIALS INVESTIGATED
INCLUDED ANODIZED ALUMINUM, MULTI-LAYERED COATINGS,
AND COMFORMABLE COATINGS. (AUTHOR)   (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 872 310   11/6   11/3
BATTELLE MEMORIAL INST COLUMBUS OHIO DEFENSE METALS
INFORMATION CENTER

REVIEW OF RECENT DEVELOPMENTS. OXIDATION-
RESISTANT COATINGS FOR REFRACTORY METALS.   (U)

JUL 70   2P   ALLEN,B. C. ;

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO REPORT DATED 8 MAY 70,
AD-869 398.

DESCRIPTORS: (*REFRACTORY METAL ALLOYS, CORROSION
INHIBITION), (*COATINGS, CORROSION INHIBITION), REVIEWS,
CHROMIUM ALLOYS, SILICIDES, SILICON COATINGS, METAL
COATINGS, SPACECRAFT   (U)

CONTENTS; COATINGS FOR CHROMIUM ALLOYS;
COATING EVALUATION; HARDWARE EVALUATION.   (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 869 334L   11/3   11/9   22/2
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

ELEVATED TEMPERATURE RESISTANT POLYMERIC
THERMAL CONTROL COATINGS.   (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. MAY 68-MAR 69,
MAR 70   43P   BOEBEL,CARL P. ;STEVENSON,
GARY E. ;
REPT. NO. AFML-TR-69-268
PROJ: AF-7340
TASK: 734007

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7 DEC 72. OTHER REQUESTS FOR THIS DOCUMENT MUST BE
REFERRED TO DIRECTOR, AIR FORCE MATERIALS LAB.,
ATTN: MANE. WRIGHT-PATTERSON AFB, OHIO
45433.

DESCRIPTORS: (*HEAT RESISTANT PLASTICS, AIRFRAMES),
(*SPACECRAFT, *PLASTIC COATINGS), TEMPERATURE CONTROL,
SILICONE PLASTICS, SILANES, THERMAL RADIATION,
REFLECTIVITY, EMISSIVITY   (U)

HIGH TEMPERATURE POLYMERIC COATINGS WITH SPECIFIC AND STABLE TAILORED RADIANT PROPERTIES HAVE BEEN DEVELOPED WHICH ARE CAPABLE OF WITHSTANDING THE ELEVATED TEMPERATURES CAUSED BY ASCENT HEATING AND REMAIN STABLE TO THE SPACE ENVIRONMENT. THREE COATING FORMULATIONS WERE FOUND TO MEET THE STIPULATED REQUIREMENTS FOR A SPECIALIZED AIR FORCE SPACECRAFT APPLICATION. THE COATINGS ARE BASED ON A CATALYZED AIR DRY SILICONE RESIN PIGMENTED WITH CHROMIUM OXIDE, SPINEL, OR RETROREFLECTIVE GLASS BEADS TO PROVIDE INFRARED EMITTANCE VALUES. EVALUATIONS CONDUCTED ON THE CANDIDATE COATINGS INCLUDE VACUUM OUTGASSING, WEIGHT LOSS, IN SITU AND NON-IN SITU OPTICAL REFLECTANCE MEASUREMENTS, VACUUM-ULTRAVIOLET DEGRADATION, AND ASCENT HEATING SIMULATION. (AUTHOR-PL)   (M)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 865 295 20/6 11/3
ARNOLD ENGINEERING DEVELOPMENT CENTER ARNOLD AIR FORCE STATION TENN

MIRROR PANEL SOLAR ABSORPTANCE TEST. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
FEB 70 68P BURCH,B. A. ;FRAZINE,D. F. ;
REPT. NO. AEDC-TR-70-5
CONTRACT: F40600-69-C-0001
PROJ: ARO-SR0926

UNCLASSIFIED REPORT
DISTRIBUTION: NO FOREIGN WITHOUT APPROVAL OF COMMANDER, SAMSO (SMSDI-STINFO) LOS ANGELES AIR FORCE STATION, CALIF. 90045.
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH ARO, INC., TULLAHOMA, TENN.

DESCRIPTORS: (*COATINGS, TEMPERATURE CONTROL), (*MIRRORS, ABSORPTION), SOLAR RADIATION, REFLECTIVITY, ABSORPTION SPECTRA, TEMPERATURE, SPACECRAFT COMPONENT(U)
IDENTIFIERS: SOLAR SIMULATION, *THERMAL CONTROL COATINGS (U)

THE PURPOSE OF THIS TEST WAS TO EXPERIMENTALLY DETERMINE THE SOLAR ABSORPTANCE OF A COMPOSITE SECOND SURFACE MIRROR PANEL, USED AS THERMAL CONTROL SURFACES. THE VARIATION OF SOLAR ABSORPTANCE AS A FUNCTION OF PANEL TEMPERATURE AND INCIDENT ANGLES OF THE SOLAR LIGHT RAYS WAS DETERMINED BY A CALORIMETRIC TECHNIQUE. WHILE THE MIRROR PANEL TEMPERATURE WAS KEPT CONSTANT, THE INTERNAL POWER SOURCE OF THE CALORIMETER WAS CHANGED DURING A SOLAR OFF TO ON CYCLE, CORRESPONDING TO THE FRACTION OF ABSORBED INCIDENT ENERGY. THE TEST WAS CONDUCTED WITH A SOLAR SIMULATOR. RADIANT ENERGY WAS PROVIDED BY FOUR 20-KW XENON AND THREE 5-KW MERCURY-XENON COMPACT ARC LAMPS. THE MIRROR PANEL SOLAR ABSORPTANCE AT 315K TEMPERATURE AND FOR PERPENDICULAR LIGHT RAYS WAS 0.072, CONFIRMING THE PREDICTED VALUE OF 0.069. THE ABSORPTANCE VALUE INCREASED AS THE INCIDENT ANGLE VARIED FROM PERPENDICULAR (I.E., 0 DEG) TO 85 DEG. A SIMILAR INCREASE WITH ANGLE WAS OBSERVED AT 200, 173, AND 147K. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL508

AD- 864 690   11/3   22/2
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

OVI-10 THERMAL CONTROL COATING ORBITAL
EXPERIMENT.   (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. JUL 66-DEC 68,
MAR 69   124P   BOEBEL,CARL P. ;
REPT. NO. AFML-TR-68-392-PT-1
PROJ: AF-7340
TASK: 734007

UNCLASSIFIED REPORT

DESCRIPTORS: (*SCIENTIFIC SATELLITES, THERMAL STRESSES), (*COATINGS, TEMPERATURE CONTROL), (*TEMPERATURE CONTROL, *COATINGS), ANODIC COATINGS, SOLAR RADIATION, ABSORPTION, EMISSIVITY, EXPERIMENTAL DATA, DEGRADATION, COMPUTER PROGRAMS, PAINTS, PLASTIC PAINTS, HEAT RESISTANT MATERIALS   (U)
IDENTIFIERS: OVI-10 SATELLITE, *THERMAL CONTROL CASTINGS   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 861 556 11/3 11/9 22/2
ARNOLD ENGINEERING DEVELOPMENT CENTER ARNOLD AIR FORCE
STATION TENN

VACUUM-IRRADIATION TESTS ON THE D-21
EXPANDABLE AIRLOCK THERMAL CONTROL COATING.
PART II. (U)

DESCRIPTIVE NOTE: FINAL REPT. MAY-JUN 69,
NOV 69 40P KIRBY,W. G. ;
REPT. NO. AEDC-TR-69-247
CONTRACT: F40600-69-C-0001
PROJ: ARO-ST0713

UNCLASSIFIED REPORT
DISTRIBUTION: NO FOREIGN WITHOUT APPROVAL OF:
ARNOLD ENGINEERING DEVELOPMENT CENTER, ATTN:
AETS. ARNOLD AIR FORCE STATION, TENN. 37389.
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH ARO,
INC., TULLAHOMA, TENN. SEE ALSO VOLUME 1, AD-
858 829.

DESCRIPTORS: (*SPACE STATIONS, EXPANDABLE STRUCTURES),
(*EXPANDABLE STRUCTURES, PROTECTIVE TREATMENTS),
(*PROTECTIVE TREATMENTS, *THERMAL INSULATION),
LAMINATES, ENVIRONMENTAL TESTS, DEGRADATION, SOLAR
RADIATION, ABSORPTION, REFLECTION, FOAM, SURFACE
PROPERTIES, ISOCYANATE PLASTICS, COATINGS, DAMAGE,
RADIATION EFFECTS (U)
IDENTIFIERS: AIRLOCKS, D-21 EXPANDABLE AIRLOCKS,
SATURN LAUNCH VEHICLES, S-4B STAGES (U)

THE OBJECTIVE OF THE TEST WAS TO DETERMINE THE
EFFECT OF ELECTRON AND PROTON ENERGY ON THE CHANGE IN
THE THERMAL RADIATIVE PROPERTIES OF THE D-21
EXPANDABLE STRUCTURE MATERIAL AND TO DETERMINE
THE EFFECT ON THESE PROPERTIES OF A COMBINED
ENVIRONMENT CONSISTING OF VACUUM, ELECTROMAGNETIC
RADIATION, ELECTRONS, AND PROTONS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 855 662   11/9
WRIGHT AIR DEVELOPMENT DIV WRIGHT-PATTERSON AFB OHIO

THE VACUUM-THERMAL STABILITY OF ORGANIC
COATING MATERIALS. PART I. THE
POLYURETHANES. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
AUG 60   44P   MATTICE,JAMES J. ;
REPT. NO. WADD-TR-60-126
PROJ: AF-7312

UNCLASSIFIED REPORT
DISTRIBUTION: NO FOREIGN WITHOUT APPROVAL OF
DIRECTOR, AIR FORCE MATERIALS LAB., ATTN:
MAAM. WRIGHT-PATTERSON AFB, OHIO 45433.

DESCRIPTORS: (*HEAT RESISTANT PLASTICS, *PLASTIC
COATINGS), (*ISOCYANATE PLASTICS, THERMAL STABILITY),
SPACECRAFT COMPONENTS, AIRFRAMES, DEGRADATION, VACUUM,
HIGH TEMPERATURE, SYNTHESIS(CHEMISTRY), SPACE SIMULATION
CHAMBERS, PIGMENTS (U)

THE REPORT IS A SURVEY OF THE BASIC KNOWLEDGE OF
POLYURETHANE CHEMISTRY AND OF THE RESEARCH WHICH HAS
BEEN CONDUCTED IN STUDYING THE SYNTHESIS AND
DEGRADATION REACTIONS OF THESE MATERIALS. THE
APPLICATION OF THIS INFORMATION IN STUDYING THE
ADVERSE EFFECTS OF THE HIGH VACUUM OF SPACE AND HIGH
TEMPERATURE IS EMPHASIZED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 850 584L   22/2   13/8
AUTONETICS ANAHEIM CALIF

STERILIZATION EFFECTS ON POLYMERIC MATERIALS,   (U)

MAY 68   35P   LEE,S. M. ;FEWELL,R. O.
;
REPT. NO. X8-297/501
MONITOR: IDEP   501.78.00.00-C1-04

UNCLASSIFIED REPORT
DISTRIBUTION LIMITED TO U. S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; 1 MAR 71. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO COMMANDING OFFICER, NAVAL FLEET MISSILE SYSTEMS ANALYSIS AND EVALUATION GROUP (CODE 262), ATTN: GIDEP OFFICE, CORONA, CALIF. 91720
SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH JET PROPULSION LAB., PASADENA, CALIF., CONTRACT NAS7-100.

DESCRIPTORS: (*SPACECRAFT COMPONENTS, *STERILIZATION), POLYMERS, ETHYLENE OXIDE, ADHESIVES, LUBRICANTS, COATINGS, TEXTILES, PRINTED CIRCUITS, LAMINATED PLASTICS, HONEYCOMB CORES, LIFE EXPECTANCY, THERMAL STABILITY, VISUAL INSPECTION   (U)
IDENTIFIERS: EVALUATION   (U)

THE EFFECTS OF ETHYLENE OXIDE DECONTAMINATION AND COMBINED EFFECTS OF ETHYLENE OXIDE DECONTAMINATION AND THERMAL STERILIZATION ON APPROXIMATELY 180 VARIOUS SPACECRAFT POLYMERIC MATERIALS ARE DISCUSSED. THE MATERIALS IN THE TWENTY DIFFERENT MATERIAL CATEGORIES CHOSEN FOR THIS STUDY WERE SUBJECTED TO THE 'JPL TYPE APPROVAL' DECONTAMINATION AND STERILIZATION PROCEDURES. THIS INCLUDED SIX SEPARATE CYCLES OF ETHYLENE OXIDE DECONTAMINATION FOR 30 HOURS/CYCLE AT 50 DEGREES C AT 50 PERCENT RELATIVE HUMIDITY. SAMPLES THEN WERE REMOVED FOR PHYSICAL TESTING AND THE SURVIVORS EXPOSED TO SIX ADDITIONAL AND SEPARATE CYCLES OF THERMAL STERILIZATION AT 135 DEGREES C FOR 96 HOURS/CYCLE IN DRY NITROGEN. THE CRITERIA FOR RELATIVELY RATING THE COMPATIBILITY OF THESE POLYMERIC MATERIALS ARE BASED ON ALLIED STUDIES. (AUTHOR)   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 706 128 22/2 11/3
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

THERMAL CONTROL COATINGS - AN ANALYTICAL
TREATMENT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. MAR-JUN 69,
MAR 70 35P TURNER,MAX A. ;BOEBEL,CARL
P. ;
REPT. NO. AFML-TR-70-8
PROJ: AF-7342
TASK: 734202

UNCLASSIFIED REPORT

DESCRIPTORS: (*SPACECRAFT COMPONENTS, COATINGS), (*COATINGS, TEMPERATURE CONTROL), SPACECRAFT, THERMAL ANALYSIS, ABSORPTION, THERMAL RADIATION (U)

THE NEED FOR VARIOUS TYPES OF THERMAL CONTROL COATINGS HAS BEEN DERIVED AND SUMMARIZED FROM AN ANALYSIS OF SELECTED THERMAL PROBLEMS FREQUENTLY ENCOUNTERED IN SPACECRAFT HARDWARE COUPLED WITH AN ANALYSIS OF VARIANCE IN THE PARAMETERS OF THE THERMAL BALANCE. THIS OVERALL ANALYSIS INDICATES THE NEED FOR A COMPLETE SERIES OF STABLE COATINGS EACH HAVING A MINIMUM (0.1 OR LOWER) SOLAR ABSORPTANCE BUT WITH DIFFERENT OR CONTROLLABLE VALUES OF INFRARED EMITTANCE RANGING FROM 0.3 TO 1.0 IN ORDER TO COVER THE ENTIRE RANGE OF DESIRABLE SOLAR ABSORPTANCE/ EMITTANCE RATIOS FROM 0.1 TO 0.3. THIS ANALYSIS WAS APPLIED ONLY TO A GENERALIZED EARTH ORBITING SPACECRAFT. WHERE INTERNAL HEAT DISSIPATION RATES EXCEEDED SEVERAL WATTS/SQ. FT., ACTIVE HEAT REMOVAL SYSTEMS WOULD BE REQUIRED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL50B

AD- 703 830   22/2   22/4
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

THE BLACK ARROW X3 SPACECRAFT.   (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
SEP 69   29P   SKETCH,H. J. H. ;
REPT. NO. RAE-TR-69203

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PRESENTED AT THE INTERNATIONAL SPACE TECHNOLOGY AND SCIENCE SYMPOSIUM (8TH), TOKYO, AUG 69.

DESCRIPTORS: (*LAUNCH VEHICLES, PAYLOAD), (*SCIENTIFIC SATELLITES, DESIGN), REFRACTORY COATINGS, THERMAL STABILITY, SOLAR CELLS, POWER SUPPLIES, DETECTORS, ELECTRONIC EQUIPMENT, DATA PROCESSING, MISSION PROFIL(U)
IDENTIFIERS: BLACK ARROW LAUNCH VEHICLES   (U)

THE X3 SPACECRAFT IN THE BLACK ARROW SERIES IS CURRENTLY UNDER CONSTRUCTION AND IT IS PLANNED TO CARRY THE FOLLOWING EXPERIMENTS: AN EXPERIMENT TO DETERMINE THE STABILITY OF A NUMBER OF NEW SURFACE FINISHES FOR THERMAL CONTROL, AN EXPERIMENT TO DETERMINE THE BEHAVIOUR OF NEW SILICON SOLAR CELL ASSEMBLIES INCLUDING ULTRA-LIGHT WEIGHT SILICON CELLS, AN EXPERIMENT IN HYBRID ELECTRONIC ASSEMBLIES, AND AN EXPERIMENT BY BIRMINGHAM UNIVERSITY TO DETERMINE THE FLUX OF MICROMETEOROIDS. THE STRUCTURE HAS THE SHAPE OF A PUMPKIN 1.1 M IN DIAMETER AND 0.7 M IN LENGTH AND IT IS WITHOUT EITHER BOOMS OR PADDLES. THE SATELLITE IS SPIN-STABILISED, THE ALL-UP WEIGHT IS ABOUT 72 KG, THE ORBIT IS NEAR POLAR, THE EXPECTED OPERATIONAL LIFETIME IS ONE YEAR AND IT WILL BE LAUNCHED IN 1971. (AUTHOR)   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 698 927 10/2 22/2
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

TYPE APPROVAL TEST REPORT ON FERRANTI SOLAR CELLS
FOR THE BLACK ARROW X3 SPACECRAFT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
MAR 69 22P DOLLERY,A. A. ;
REPT. NO. RAE-TR-69046

UNCLASSIFIED REPORT

DESCRIPTORS: (*SCIENTIFIC SATELLITES, SOLAR CELLS), (*SOLAR CELLS, RELIABILITY(ELECTRONICS)), PHOTODIODES, ACCEPTABILITY, ELECTRICAL PROPERTIES, OPTICAL PROPERTIES, RESPONSE, DAMAGE, RADIATION EFFECTS, THERMAL STABILITY, VISUAL INSPECTION, ELECTRIC TERMINALS, SOLDERING, OPTICAL COATINGS, GREAT BRITAIN (U)
IDENTIFIERS: BLACK ARROW X3 SATELLITES (U)

THE REPORT PRESENTS THE RESULTS OF TYPE APPROVAL TESTS PERFORMED ON SOLAR CELLS INTENDED FOR USE IN THE BLACK ARROW X3 SPACECRAFT. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 691 506 10/2 22/2
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

ENVIRONMENTAL ASSESSMENT OF THIN SILICON SOLAR CELLS FROM PILOT PRODUCTION. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JAN 69 42P CRABB,R. L. ;
REPT. NO. RAE-TR-69006

UNCLASSIFIED REPORT

DESCRIPTORS: (*SOLAR PANELS, SOLAR CELLS), (*SOLAR CELLS, RELIABILITY(ELECTRONICS)), SILICON, SPACE ENVIRONMENTS, DAMAGE, RADIATION EFFECTS, ELECTRONS, PROTONS, MANUFACTURING, PROTECTIVE TREATMENTS, METAL COATINGS, ELECTRIC TERMINALS, CORROSION INHIBITION, PERFORMANCE(ENGINEERING), STORAGE, HUMIDITY, THERMAL STABILITY, LIQUID IMMERSION TESTS, FAILURE(ELECTRONICS), GREAT BRITAIN (U)
IDENTIFIERS: EVALUATION (U)

FOLLOWING THE EARLIER DEMONSTRATION OF THE PERFORMANCE CAPABILITIES OF 4 MIL SILICON SOLAR CELLS AND THE FEASIBILITY OF USING THESE CELLS ON LARGE FLEXIBLE ARRAYS OF SPACE VEHICLES, MORE THAN A THOUSAND 4 MIL CELLS HAVE BEEN FABRICATED IN PILOT PRODUCTION BY FOUR ROUTES. THE VARIOUS TYPES OF CELLS WHICH HAVE BEEN EVALUATED HAD SOLDERLESS EVAPORATED TITANIUM-SILVER CONTACTS IN BOTH A CONVENTIONAL AND WRAP-ROUND CONFIGURATION, SOLDERLESS EVAPORATED TITANIUM-SILVER CONTACTS 'OVER-PLATED' WITH A LAYER OF COPPER-GOLD, AND SOLDERLESS PLATED NICKEL-COPPER-GOLD CONTACTS IN A CONVENTIONAL AND WRAP-ROUND CONFIGURATION. BOTH 1 X 2 AND 2 X 2 CM, N ON P CELLS HAVE BEEN MANUFACTURED FROM 1 AND 10 OHM CM BORON DOPED SILICON. IN EVERY CASE, SATISFACTORY PRODUCTION YIELDS HAVE BEEN ACHIEVED. THE ABOVE CELLS HAVE BEEN SUBJECTED TO ENVIRONMENTAL CONDITIONS AIMED AT STUDYING THE EFFECTS OF HIGH AMBIENT HUMIDITY ON THE CELL CONTACTS DURING 'SHELF-LIFE' PRIOR TO LAUNCH AND THE DEGRADATION IN PERFORMANCE FROM ELECTRON AND PROTON IRRADIATION ENCOUNTERED DURING LONG TERM SPIRAL TRANSFER ORBITS TO SYNCHRONOUS ALTITUDE. SPECIFICALLY THE PROBLEM OF LOW ENERGY 'SYNCHRONOUS ALTITUDE' PROTON IRRADIATION OF EXPOSED BAR AND BACK CONTACTS AND THE PROTECTION AFFORDED BY VARIOUS FORMS OF COATINGS HAS BEEN INVESTIGATED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL508

AD- 688 908 22/2 20/13
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

THERMAL CONTROL SURFACE RESEARCH AT THE ROYAL AIRCRAFT ESTABLISHMENT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
NOV 68 37P SMITH,A. E. ;
REPT. NO. RAE-TR-68276

UNCLASSIFIED REPORT

DESCRIPTORS: (*SATELLITES(ARTIFICIAL), THERMAL STRESSES), THERMAL STABILITY, SURFACE PROPERTIES, SPACE ENVIRONMENTS, REFLECTIVITY, DEGRADATION, PLASTIC PAINTS, PIGMENTS, VACUUM, LIFE EXPECTANCY, ULTRAVIOLET RADIATION, PHOTON BOMBARDMENT, GREAT BRITAIN (U)

THE REPORT DEFINES FOUR BASIC CLASSES OF THERMAL CONTROL SURFACE AND THE RESEARCH BEING CARRIED OUT ON EACH TYPE OF SURFACE. DETAILS ARE GIVEN OF THE APPARATUS USED TO MEASURE THE REFLECTANCE PROPERTIES OF THE SURFACES AND THE FACILITIES AVAILABLE TO SIMULATE THE SPACE ENVIRONMENT. FINALLY, A DESCRIPTION IS GIVEN OF THE PRELIMINARY DESIGN OF A SATELLITE-BORNE EXPERIMENT DESIGNED TO TEST THERMAL CONTROL SURFACES IN SPACE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL508

AD- 678 799   20/13   11/3   22/2
LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF LOCKHEED
PALO ALTO RESEARCH LAB

OPTICAL SOLAR REFLECTOR: A HIGHLY STABLE, LOW
AS/E SPACECRAFT THERMAL CONTROL SURFACE,   (U)

JUN 68   6P   MARSHALL,K. N. ;BREUCH,R.
A. ;
CONTRACT: AF 33(615)-5066, NAS2-3063

UNCLASSIFIED REPORT
AVAILABILITY: PUB. IN JNL. OF SPACECRAFT AND
ROCKETS, V5 N9 P1051-1056 SEP 68.
SUPPLEMENTARY NOTE: REVISION OF MANUSCRIPT RECEIVED 16
OCT 67.

DESCRIPTORS: (*SPACECRAFT, *THERMAL INSULATION),
(*OPTICAL COATINGS, REFLECTIVITY), SOLAR RADIATION,
MIRRORS, INFRARED SPECTRA, ULTRAVIOLET SPECTRA, VISIBLE
SPECTRA, ABSORPTION, THERMAL RADIATION, STABILITY,
SUBSTRATES, PARTICLE SPECTRA, SOLAR FLARES, SOLAR
WIND   (U)

A STABLE, LOW AS/E SPACECRAFT THERMAL CONTROL
SURFACE HAS BEEN DEVELOPED. THE MATERIAL IS
BASICALLY A SECOND-SURFACE MIRROR COMPOSED OF SILVER
VACUUM DEPOSITED ON HIGH-PURITY FUSED SILICA WHICH
GIVES AS/E = 0.062 AT 295K. EXPERIMENTAL
DETERMINATIONS OF A/S FOR 180 AND 295K AND
MEASUREMENTS OF E FOR THE TEMPERATURE RANGE OF 83
TO 750K ARE PRESENTED. A SUMMARY OF LABORATORY
SIMULATED EXPOSURES TO VAN ALLEN PROTON,
ARTIFICIAL ELECTRON BELT, SOLAR WIND PROTON, SOLAR
ULTRAVIOLET, AND SLECTED COMBINATIONS OF ENVIRONMENTS
IS PRESENTED AND DEMONSTRATES THAT THE MATERIAL IS
STABLE. IN ADDITION, SINUSOIDAL AND RANDOM
VIBRATION, MECHANICAL SHOCK, AND THERMAL CYCLING TEST
RESULTS ARE REPORTED WHICH SHOW MECHANICAL INTEGRITY
FOR THE IMPOSED TEST CONDITIONS. RESULTS OF
STUDIES TO DETERMINE SUITABLE APPLICATION TECHNIQUES
ARE DISCUSSED. THE OPTICAL SOLAR REFLECTOR
WAS FOUND TO HAVE THE LOWEST AS/E OF ANY
PRODUCTION THERMAL CONTROL COATING AVAILABLE; IT
AFFORDS A SOLUTION FOR RELIABLE THERMAL CONTROL OF
MANY ADVANCED SPACECRAFT SYSTEMS. (AUTHOR)   (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 669 057 11/3 5/2
AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO

THERMAL CONTROL COATINGS DATA RETRIEVAL SYSTEM. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT. MAY 66-MAY 67,
MAY 67 32P BOEBEL,CARL P. ;
REPT. NO. AFML-TR-67-353
PROJ: AF-7340
TASK: 734007

UNCLASSIFIED REPORT

DESCRIPTORS: (*COATINGS, *INFORMATION RETRIEVAL), TEMPERATURE CONTROL, SPACECRAFT COMPONENTS, PROTECTION, OPTICAL PROPERTIES, CLASSIFICATION, IDENTIFICATION, CHEMICAL PROPERTIES, CODING, DATA PROCESSING, COMPUTER PROGRAMS (U)
IDENTIFIERS: *PROTECTIVE COATINGS, *THERMAL CONTROL COATINGS (U)

A COMPUTERIZED DATA RETRIEVAL SYSTEM FOR THERMAL CONTROL COATINGS WAS DEVISED. THIS GENERAL CLASSIFICATION SYSTEM FOR COATINGS, WHILE SPECIFICALLY ORIENTED TOWARD OPTICAL CHARACTERISTICS FOR SATELLITE USE, CAN HAVE OTHER APPLICATIONS. THE BASIC USE OF THIS SYSTEM IS DIRECTED TO THERMAL DESIGNERS AND MATERIALS ENGINEERS IN THE AEROSPACE FIELD FOR DATA RETRIEVAL. THIS DOCUMENT PRESENTS AN 'OUT-OF-THE-DESIGN-LOOP' ASSIST TO THE THERMAL DESIGNER FOR SELECTION OF THE OPTIMUM COATINGS. IT IS ANTICIPATED THAT WITH ACCEPTANCE AND INEVITABLE MODIFICATIONS TO THIS BASIC SYSTEM, IT CAN BE PLACED INTO THE THERMAL DESIGN COMPUTER PROGRAM IN THE NEAR FUTURE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 666 364 11/2 11/3 22/1
LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF LOCKHEED
PALO ALTO RESEARCH LAB

EFFECTS OF COMBINED SPACE RADIATION ON SOME MATERIALS
OF LOW SOLAR ABSORPTANCE, (U)

APR 67 7P BAILIN,L. J. ;

UNCLASSIFIED REPORT
AVAILABILITY: PUBLISHED IN NATIONAL SAMPE
SYMPOSIUM (11TH), P125-31 APR 1967.

DESCRIPTORS: (*REFRACTORY MATERIALS, SPACE
ENVIRONMENTS), (*SILICATES, DAMAGE), ZIRCONIUM OXIDES,
SILICON DIOXIDE, COATINGS, PIGMENTS, BINDERS,
ULTRAVIOLET RADIATION, PROTON BOMBARDMENT, ELECTRON
IRRADIATION, IMPURITIES, OPTICAL PROPERTIES, STABILITY,
SPACECRAFT, TEMPERATURE CONTROL, (U)TEMPERATURE
CONTROL (U)

THE REFRACTORY MATERIAL ZRO2.SIO2 IS
DISCUSSED AS A COMPONENT OF INORGANIC SILICATE BINDER
SYSTEMS WHICH ARE STABLE OPTICALLY AND PHYSICALLY
UNDER A VARIETY OF GROUND-SIMULATED SPACE CONDITIONS.
THESE SYSTEMS ARE FINDING APPLICATION AS PASSIVE
THERMAL CONTROL AND HEAT REJECTION COATINGS ON
SPACECRAFT SURFACES. THE ENVIRONMENTS DISCUSSED
ARE COMBINED ULTRAVIOLET-ELECTRON, ULTRAVIOLET-
PROTON, AS WELL AS THE CORRESPONDING, BUT SEPARATE
ULTRAVIOLET, ELECTRON, AND PROTON ENVIRONMENTS.
PREVIOUSLY DETERMINED DATA ON NEUTRON-GAMMA
EXPOSURES ARE ALSO INCLUDED. FOR ZRO2.SIO2
AS A PIGMENT, IT IS SHOWN THAT IMPURITY CONTENT AND
TEMPERATURE OF PREPARATION BEAR STRONGLY ON THE
OPTICAL PROPERTIES, AND CONSEQUENTLY ON THE ABILITY
TO REFLECT SOLAR RADIATION AND REJECT HEAT. THE
USE OF VERY HIGH PURITY STARTING MATERIALS IS SHOWN
AS A REQUIREMENT TO OBTAIN LOW SOLAR ABSORPTANCE,
ALPHA-S, (HIGH SOLAR REFLECTANCE), AS WELL AS
OPTICAL STABILITY UNDER ULTRAVIOLET RADIATION. FOR
HIGH PURITY PIGMENTS, COMBINED UV-P, UV-E
EXPOSURES, LITTLE OR NO SYNERGISM OF EFFECTS IS
NOTED; THAT IS, NO GREATER INCREASES IN ALPHA-S (NO
GREATER DISCOLORATION) RESULTED FROM THE COMBINED
EXPOSURE THAN FROM THE UV, P, AND E EXPOSURES
SEPARATELY. SMALL CHANGES RESULTED FROM THE PROTON
AND ELECTRON EXPOSURES, AND NO DIRECT CORRELATION
WITH PURITY WAS NOTED. FOR ZRO2.SIO2
INCORPORATED INTO SILICATE BINDERS, THE RELATIONS OF
PURITY AND PREPARATION VARIABLES TO STABILITY ARE
SIMILAR TO THOSE FOR THE PIGMENT ALONE. HOWEVER, (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLL508

AD- 661 963   22/2   11/3
AEROSPACE CORP EL SEGUNDO CALIF LAB OPERATIONS

SYSTEM REQUIREMENTS FOR THERMAL CONTROL COATINGS, (U)

SEP 67   31P   BORSON,EUGENE N. ;
REPT. NO. TR-0158(3250-20)-2
CONTRACT: F04695-67-C-0158
MONITOR: SAMSO   TR-67-63

UNCLASSIFIED REPORT

DESCRIPTORS: (*COATINGS, *THERMAL INSULATION), (*SPACECRAFT, THERMAL INSULATION), OPTICAL PROPERTIES, HEATING, DAMAGE, RADIATION EFFECTS, MECHANICAL PROPERTIES, TEMPERATURE CONTROL, CLEANING, TOXICITY, FLAMMABILITY, COSTS, ABUNDANCE (U)

THE MAIN FACTORS USUALLY CONSIDERED IN THE SELECTION OF THERMAL CONTROL COATINGS FOR SPACECRAFT ARE AS FOLLOWS: (A) OPTICAL PROPERTIES AND THEIR QUANTITATIVE UNCERTAINTIES. (B) APPLICATION, GROUND ENVIRONMENT, AND CLEANING. (C) ATMOSPHERIC HEATING. (D) PARTICULATE AND ULTRAVIOLET RADIATION STABILITY. (E) OUTGASSING, TOXICITY, AND FLAMMABILITY. (F) MECHANICAL PROPERTIES, (G) COST. (H) AVAILABILITY. THESE ITEMS ARE DISCUSSED AND EXAMPLES ARE PRESENTED. ATTENTION IS GIVEN TO OPTICAL PROPERTY UNCERTAINTIES, AND TYPICALLY USED COATINGS ARE USED AS EXAMPLES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLL50B

AD- 657 154 13/13 22/2
JOHNS HOPKINS UNIV SILVER SPRING MD APPLIED PHYSICS LAB

A PRACTICAL SOLUTION TO THE PROBLEM OF THERMAL BENDING IN SPACECRAFT EXTENDIBLE BOOMS. (U)

DESCRIPTIVE NOTE: TECHNICAL MEMO.,
JUN 67 65P RABENHORST,D. W. ;
REPT. NO. TG-915
CONTRACT: NOW-62-0604

UNCLASSIFIED REPORT

DESCRIPTORS: (*EXTENDABLE STRUCTURES, SPACECRAFT COMPONENTS), (*THERMAL INSULATION, EXTENDABLE STRUCTURES), BENDING, SHIELDING, SOLAR RADIATION, COMPATIBILITY, EFFECTIVENESS, FOILS(MATERIALS), CONFIGURATION, DESIGN, POLYESTER PLASTICS, ALUMINUM COATINGS (U)

THE REPORT CONSIDERS SOLUTIONS FOR THE PROBLEM OF PROTECTING SPACECRAFT EXTENDIBLE BOOMS FROM THERMAL BENDING IN SUNLIGHT. IT WAS THEORIZED THAT SUCH PROTECTION COULD BE ACHIEVED BY DEVISING A SUNSHIELD THAT WOULD FIT AROUND THE BOOM LIKE A SHROUD, AND THAT THERMAL BENDING WOULD THUS BE REDUCED BY ORDERS OF MAGNITUDE. HOWEVER, NO DESIGNS THAT WOULD PROVIDE THE DESIRED PROTECTION AND AT THE SAME TIME MAINTAIN COMPATIBILITY BETWEEN THE BOOM AND THE BOOM-ERECTION EQUIPMENT WERE FORTHCOMING AND WORK ON THE SUNSHIELD WAS ABANDONED. THIS REPORT DESCRIBES A SERIES OF SUNSHIELD CONFIGURATIONS THAT SATISFY THE COMPATIBILITY REQUIREMENTS AND HAVE THE FOLLOWING CHARACTERISTICS: STOWED VOLUME - < 2 CU IN/100 FT; WEIGHT - LESS THAN 2 OZ/100 FT; PROJECTED AREA DEPLOYED - 2-3 TIMES THAT OF THE BARE BOOM; DEPLOYMENT - AUTOMATIC - NO EXTRA EQUIPMENT REQUIRED; RETRACTION AND REDEPLOYMENT - AUTOMATIC - NO EXTRA EQUIPMENT REQUIRED; THERMAL IMPROVEMENT OVER BARE BOOM - GREATER THAN 1000%. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CL-25K

AD- 887 601 22/2
BUNDESMINISTERIUM FUER BILDUNG UND WISSENSCHAFT BONN (WEST GERMANY)

PROJEKT HELIOS. PHASE C: ARBEITEN AM BLENDENSYSTEM (PROJECT HELIOS. PHASE C: DEVELOPMENT OF THE THERMAL LOUVER SYSTEM). (U)

DESCRIPTIVE NOTE: FORSCHUNGSBERICHT,
MAY 71 86P BEY,R. ;PREISS,H. ; STEPHAN,H. ;
REPT. NO. BMBW-FB-W-71-12

UNCLASSIFIED REPORT
DISTRIBUTION: DDC USERS ONLY.
SUPPLEMENTARY NOTE: TEXT IN GERMAN; SUMMARY IN ENGLISH.

DESCRIPTORS: (*SOLAR SATELLITES, TEMPERATURE CONTROL), THERMOSTATS, SOLAR RADIATION, FINS, DESIGN, HEAT SHIELDS, HELICAL SPRINGS, HEAT RESISTANT ALLOYS, HEAT RESISTANT METALS, LAMINATES, ADHESIVES, ALUMINUM, IMIDES, RECTANGULAR BODIES, CYLINDRICAL BODIES, SANDWICH PANELS, MANUFACTURING, WEST GERMANY (U)
IDENTIFIERS: DEEP SPACE PROBES, HELIOS SOLAR PROBE, *LOUVERS (U)

THE PRESENT REPORT DEALS WITH PRE-DEVELOPMENT WORK ON THE LOUVER SYSTEM FOR THE SOLAR PROBE HELIOS. THE FOLLOWING PROBLEMS ARE INVESTIGATED: THE TYPE OF LOUVER TO BE CHOSEN, THE MANUFACTURING TECHNOLOGY FOR BLADES, SELECTION OF BI-METAL SPIRALS, IMPROVEMENT OF AN EXISTING LOUVER SET; ESTABLISHMENT OF A MATERIAL-PROCUREMENT PLAN, AND THE DETERMINATION OF THE TEMPERATURE OF LOUVER COMPONENTS DURING ACQUISITION. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLT25K

AD- 874 311L 11/3
GENERAL DYNAMICS SAN DIEGO CALIF GENERAL ATOMIC DIV

STUDY OF DEGRADATION OF THERMAL CONTROL
COATING MATERIALS. (U)

DESCRIPTIVE NOTE: QUARTERLY PROGRESS REPT. NO. 1, 1 JUN-
31 AUG 67,
SEP 67 36P COMPTON,D. M. J. IFIRLE,
T. I
REPT. NO. GACD-8241
CONTRACT: F33615-67-C-1810

UNCLASSIFIED REPORT
DISTRIBUTION: CONTROLLED: ALL REQUESTS TO
DIRECTOR, AIR FORCE MATERIALS LAB., ATTN:
MANE. WRIGHT-PATTERSON AFB, OHIO 45433.

DESCRIPTORS: (*REFRACTORY COATINGS, DAMAGE), ULTRAVIOLET
RADIATION, CHARGED PARTICLES, POWDERS, PIGMENTS, RUTILE,
TITANIUM COMPOUNDS, QUARTZ, SURFACE PROPERTIES, ENERGY
MANAGEMENT, CONDUCTIVITY, TEST EQUIPMENT, TEST METHODS,
GAS CHROMATOGRAPHY, REFLECTOMETERS, VACUUM APPARATUS,
PARTICLE ACCELERATORS, DEGRADATION, DIOXIDES,
TEMPERATURE CONTROL, (U)TEMPERATURE CONTROL (U)

CONTENTS: SAMPLE PREPARATION -- SOURCE
MATERIALS, CHEMICAL REDUCTION OF TIO2, QUARTZ
DISPERSANT; EXPERIMENTAL APPARATUS --
ELECTRICAL CONDUCTIVITY, GAS CHROMATOGRAPH, IN-
VACUO REFLECTOMETER FOR MEASUREMENTS OF EFFECTS OF
SIMULTANEOUS IRRADIATION WITH ULTRA-VIOLET LIGHT AND
CHARGED PARTICLES, GENERAL DESIGN, INTEGRATING
SPHERE DESIGN, PARTICULATE RADIATION, VACUUM
SYSTEM; RESULTS -- METHODS OF PREPARING ADHERENT
SAMPLES FROM POWDERS, SURFACE TEMPERATURE OF RUTILE
POWDER SAMPLES, COMPARISON BETWEEN TIO2 TREATED
IN VARIOUS WAYS, EVOLVED GASES; FUTURE
PLANS. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLT25K

AD- 825 348L 22/2 13/1 11/3
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

ALTERNATIVE WHITE THERMAL CONTROL SURFACES FOR THE UK3 SATELLITE. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
MAR 67 23P PORTER,J. ;
REPT. NO. RAE-TR-67055

UNCLASSIFIED REPORT
DISTRIBUTION: DOD AND DOD CONTRACTORS ONLY: OTHERS TO BRITISH MINISTRY OF AVIATION SUPPLY VIA THE APPROPRIATE CHANNEL.

DESCRIPTORS: (*SATELLITES(ARTIFICIAL), *TEMPERATURE CONTROL), (*PLASTIC PAINTS, SURFACE TEMPERATURE), THERMAL RADIATION, HEAT TRANSFER, COATINGS, SPECIFICATIONS, REFLECTORS, ZINC COMPOUNDS, OXIDES, POTASSIUM COMPOUNDS, SILICATES, ULTRAVIOLET RADIATION, DAMAGE, RADIATION EFFECTS, METAL COATINGS, REFLECTION, GREAT BRITAIN, SOLAR RADIATION (U)
IDENTIFIERS: *UK-3 SATELLITE (U)

THIS REPORT DISCUSSES THE SPECIFICATION AND TESTING OF WHITE THERMAL CONTROL SURFACES FOR THE UK3 SATELLITE. THE SOLUTION PROPOSED UTILISES A UNIQUE SCHEME OF A GOOD MECHANICAL WHITE REFLECTOR OVERCOATED WITH A ZINC OXIDE POTASSIUM SILICATE MATERIAL WHICH PROTECTS THE UNDERCOAT FROM DAMAGING ULTRA VIOLET RADIATION AND IS ITSELF NOT SIGNIFICANTLY AFFECTED BY EXPOSURE TO SUCH RADIATION. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLT25K

AD- 825 347L 22/2 13/1
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

PRINCIPLES AND TECHNIQUES IN THE PASSIVE THERMAL CONTROL OF SPACECRAFT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
APR 67 62P SEMPLE,E. C. ;

REPT. NO. RAE-TR-67100

UNCLASSIFIED REPORT
DISTRIBUTION: DOD AND DOD CONTRACTORS ONLY; OTHERS TO BRITISH MINISTRY OF AVIATION SUPPLY VIA THE APPROPRIATE CHANNEL.

DESCRIPTORS: (*SATELLITES(ARTIFICIAL), *TEMPERATURE CONTROL), PASSIVE SYSTEMS, SURFACE TEMPERATURE, COATINGS, HEAT TRANSFER, THERMAL RADIATION, CONDUCTION(HEAT TRANSFER), PERIODIC VARIATIONS, ALBEDO(ASTRONOMY), SOLAR RADIATION, MATHEMATICAL ANALYSIS, GREAT BRITAIN (U)

THIS REPORT IS AN INTRODUCTORY WORK OUTLINING THE FACTORS WHICH AFFECT THE OPERATING TEMPERATURE OF A SPACECRAFT AND THE TECHNIQUES WHICH MAY BE EMPLOYED TO MINIMISE THE VARIATION OF THIS TEMPERATURE OVER ALL THE CONDITIONS IN WHICH THE SPACECRAFT MAY BE REQUIRED TO OPERATE. IT IS ASSUMED THAT ONLY PASSIVE MEANS OF THERMAL CONTROL MAY BE EMPLOYED I.E., THAT CONTROL IS AFFECTED SOLELY BY THE APPLICATION OF SELECTED THERMAL COATINGS TO THE SURFACE OF THE SPACECRAFT, AND NOT BY ANY MECHANICAL MEANS INVOLVING THE MOVEMENT OF LOUVRES, FOR EXAMPLE. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLT25K

AD-B004 283L   22/2   11/3   20/6
MCDONNELL DOUGLAS ASTRONAUTICS CO-EAST ST LOUIS MO

INVESTIGATION OF CONTAMINATION EFFECTS ON
THERMAL CONTROL MATERIALS. (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. 14 MAY 73-14
JUN 74.
JAN 75   106P   HUGHES,THOMAS A. ;ALLEN,
THOMAS H. ;LINFORD,RODNEY M. F. ;BONHAM,
THOMAS E. ;
CONTRACT: F33615-73-C-5091
PROJ: AF-7340
TASK: 734007
MONITOR: AFML   TR-74-218

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DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY;
TEST AND EVALUATION; OCT 74. OTHER REQUESTS FOR
THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE
MATERIALS LAB., ATTN: MBE. WRIGHT-PATTERSON
AFB, OHIO 45433.

DESCRIPTORS: (*COATINGS, *CONTAMINATION),
(*MIRRORS, CONTAMINATION), (*TEMPERATURE
CONTROL, COATINGS), (*SPACECRAFT COMPONENTS,
CONTAMINATION), SUBSTRATES, POLYMERS,
CONTAMINANTS, SURFACES, FINISHES, COLORANTS,
OPTICS, OPTICAL PROPERTIES, DEPOSITION, RATES,
EVAPORATION, REFLECTANCE, SPACECRAFT, SPACE
SIMULATION CHAMBERS, ULTRAVIOLET RADIATION, ELECTRON
BEAMS, PROTON BEAMS, GOLD, TETRAFLUOROETHYLENE
RESINS, PAINTS, ALUMINUM COATINGS, METAL COATINGS,
CERAMIC COATINGS, OPTICAL COATINGS (U)
IDENTIFIERS: *THERMAL CONTROL COATINGS (U)

RESULTS ARE DESCRIBED OF HIGHLY PRECISE
MEASUREMENTS OF DEPOSITION RATES OF POLYMERIC
CONTAMINANTS ON VARIOUS TYPES OF THERMAL CONTROL
SURFACES, AND THEIR SUBSEQUENT REEVAPORATION RATES
UNDER A SIMULATED SPACE ENVIRONMENT. RESULTS ARE
ALSO PRESENTED ON THE CHANGES IN BIDIRECTIONAL
REFLECTANCE OF A GOLD MIRROR DUE TO CONTAMINATION AND
SUBSEQUENT IRRADIATION BY ULTRAVIOLET ENERGY AND
ELECTRONS AND PROTONS. THE EFFECT OF CONTAMINATION
AND RADIATION ON THE HEMISPHERICAL REFLECTANCE AND
SOLAR ABSORPTANCE OF SECOND SURFACE MIRRORS WAS ALSO
STUDIED. THE PRESENCE OF RADIATION WAS FOUND TO
HAVE A PROFOUND INFLUENCE ON CONTAMINATION KINETICS,
AND SOME TOTALLY UNEXPECTED RESULTS OCCURRED IN THE
BIDIRECTIONAL REFLECTANCE MEASUREMENTS OF THE GOLD
MIRRORS AS THEY WARMED FROM CRYOGENIC TEMPERATURES. (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLT25K

AD-B001 599L   11/6   22/2
SPAR AEROSPACE PRODUCTS LTD MALTON (ONTARIO)

OXIDATION OF INCONEL X750 AND TYPE 321
STEEL FOIL TO PROVIDE SURFACE WITH
CONTROLLED THERMAL RADIATIVE PROPERTIES, (U)

FEB 74   6P   MUNRO,A. ;

REPT. NO. SPAR-TM.1048
MONITOR: GIDEP 570.40.10.40-CL-01

UNCLASSIFIED REPORT

DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; 12 FEB 75. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO OFFICER-IN-CHARGE (CODE 862), FLEET MISSILE SYSTEMS ANALYSIS AND EVALUATION GROUP ANNEX, ATTN: GIDEP ADMINISTRATION OFFICE. CORONA, CALIF. 91720.

DESCRIPTORS: (*NICKEL ALLOYS, OXIDATION), (*STEEL, OXIDATION), FOILS(MATERIALS), SURFACES, THERMAL RADIATION, TEMPERATURE CONTROL, ARRAYS, SOLAR PANELS, EMITTANCE, ABSORPTION, COMMUNICATION SATELLITES (U)

IDENTIFIERS: *NICKEL ALLOY INCONEL X750, INCONEL X750 NICKEL ALLOY, *STEEL 321, COMMUNICATIONS TECHNOLOGY SATELLITE (U)

TESTS WERE MADE ON DIFFERENT FOILS TO ESTABLISH A TECHNIQUE TO UNIFORMLY OXIDIZE THE SURFACE OF INCONEL X750 AND TYPE 321 STEEL MATERIAL TO PROVIDE MATERIALS WITH CONTROLLED SURFACE RADIATIVE PROPERTIES. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLT25K

AD-A036 904   21/3   22/2
FAIRCHILD REPUBLIC CO FARMINGDALE N Y

PULSED PLASMA PLUME STUDIES. (U)

DESCRIPTIVE NOTE: FINAL REPT. MAR 75-NOV 76,
MAR 77   100P   GUMAN,WILLIAM J. ;BEGUN, MARTIN ;
CONTRACT: F04611-75-C-0037
PROJ: 3058
TASK: 12
MONITOR: AFRPL   TR-77-2

UNCLASSIFIED REPORT

DESCRIPTORS: *ELECTRIC PROPULSION, *SPACE PROPULSION, *THRUSTERS, *EXHAUST PLUMES, *PLASMA ENGINES, STATIONKEEPING, ROCKET EXHAUST, SPACECRAFT, SOLAR CELLS, CONTAMINATION, SURFACES, SOLID PROPELLANTS, INSTRUMENTATION, TEST FACILITIES, VACUUM CHAMBERS, ION DENSITY, TEMPERATURE CONTROL (U)
IDENTIFIERS: WUAFRPL305812TF, PE62302F (U)

THE EXHAUST PLUME OF A MILLIPOUND THRUST LEVEL PULSED PLASMA THRUSTER WAS STUDIED IN A VACUUM CHAMBER HAVING ALL WALLS COOLED BY LIQUID NITROGEN. THIS THRUSTER HAS A PROPULSIVE PERFORMANCE CAPABLE OF MEETING NORTH-SOUTH STATION-KEEPING REQUIREMENTS OF SATELLITES. THE MAJOR SOURCE OF CONTAMINATION OF A SURFACE LOCATED IN THE FACILITY WAS IDENTIFIED TO BE MAINLY DUE TO MASS BEING SCATTERED OFF THE WALLS OF THE TEST FACILITY BECAUSE THE WALLS WERE INCAPABLE OF ABSORBING THE HIGHLY ENERGETIC PLUME OF THE FIRST ENCOUNTER WITH THE WALL. BY MEANS OF A LANGMUIR PROBE, CALORIMETRIC DISCS, A COLLIMATED QCM AND COLLIMATED GLASS CAPTURE CUPS IT WAS FOUND THAT THE TRANSIENT PLUME IS FAIRLY WELL COLLIMATED AND THAT THE OUTER EXTREMITIES OF THE PLUME ARE LOCATED WITHIN + OR - 30 DEGREES TO + OR - 40 DEGREES WITH RESPECT TO THE GEOMETRIC CENTER LINE OF THE THRUSTER THAT WAS STUDIED. WHETHER OR NOT MAJOR CHANGES OF THE EXHAUST CONE WOULD CHANGE THIS LOCATION WAS NOT EXAMINED. TIME RESOLVED STUDIES OF THE PLUME BY A LANGMUIR PROBE AND A PHOTOCELL HAS SHOWN THE LIFE OF THE PLUME AT A REGION IN SPACE TO BE ONLY A FEW TENS OF MICROSECONDS. THIS RESULT REVEALS THAT A SPACECRAFT SURFACE EXPOSED OVER A 5 TO 7 YEAR PERIOD TO THE PLUME OF A NORTH-SOUTH STATION KEEPING THRUSTER WILL ACTUALLY SEE AN ACCUMULATED PLUME FLOW TIME FOR ONLY(U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLT25K

AD-A034 864   22/2   20/13   20/6
GENERAL DYNAMICS/CONVAIR SAN DIEGO CALIF

SECOOND SURFACE THERMAL CONTROL MIRRORS FOR REFLECTION CONTROL. VOLUME II. ANNEXES I THRU X.   (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. MAR 74-MAR 75,
JAN 77   138P   NEU,J. T. ;DORIAN,M. F.
;

CONTRACT: F04701-74-C-0318
PROJ: 2132
MONITOR: SAMSO   TR-76-92-VOL-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 1, AD-A034 863.

DESCRIPTORS: *TEMPERATURE CONTROL, *SPACECRAFT, *REFLECTIVITY, SURFACE PROPERTIES, SOLAR RADIATION, DIFFUSE REFLECTION, SPECULAR REFLECTION, ETCHING, HYDROGEN FLUORIDE, FAR INFRARED RADIATION, TETRAFLUOROETHYLENE RESINS   (U)
IDENTIFIERS: FUSED SILICA, SECOND SURFACE MIRRORS, INFRARED MIRRORS, PE63438F   (U)

CONTENTS: EXPERIMENTAL DIRECTIONAL-HEMISPHERICAL REFLECTANCE FROM 0.28 TO 2.5 MICROMETERS AND CALCULATION OF SOLAR ABSORPTANCE, EXPERIMENTAL DIRECTIONAL-HEMISPHERICAL REFLECTANCE FROM 2.0 TO 30 MICROMETERS AND CALCULATION OF THERMAL EMITTANCE, BIDIRECTIONAL REFLECTANCE, TEST PLAN - SECOND SURFACE MIRRORS, HEMISPHERICAL-DIRECTIONAL REFLECTANCE 0.3 TO 7.0 MICROMETERS, DIRECTIONAL-HEMISPHERICAL REFLECTANCE ERAS FORMAT, DIRECTIONAL-HEMISPHERICAL REFLECTANCE, AND DIRECTIONAL EMITTANCE 2.5 TO 30 MICROMETERS AND 200 TO 700 K, DIRECTIONAL-HEMISPHERICAL REFLECTANCE (U.V., VIS, NEAR I.R.), BIDIRECTIONAL REFLECTANCE, THEORY AND COMPUTER PROGRAMS FOR SUBSTRATE DESIGN.   (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLT25K

AD-A034 863   22/2   20/13   20/6
GENERAL DYNAMICS/CONVAIR SAN DIEGO CALIF

SECOND SURFACE THERMAL CONTROL MIRRORS FOR
REFLECTION CONTROL. VOLUME I.   (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. MAR 74-MAR 75,
JAN 77   67P   NEU,J. T. ;DORIAN,M. F.
;
CONTRACT: F04701-74-C-0318
PROJ: 2132
MONITOR: SAMSO   TR-76-92-VOL-1

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO VOLUME 2, AD-A034
864.

DESCRIPTORS: *TEMPERATURE CONTROL, *SPACECRAFT,
*REFLECTIVITY, SURFACE PROPERTIES, SPECULAR
REFLECTION, SOLAR RADIATION, ETCHING, HYDROGEN
FLUORIDE, TETRAFLUOROETHYLENE RESINS, FAR INFRARED
RADIATION, DIFFUSE REFLECTION,   (U)
IDENTIFIERS: FUSED SILICA, SECOND SURFACE MIRRORS,
INFRARED MIRRORS, PE63438F   (U)

THIS FINAL REPORT DOCUMENTS THE RESULTS OF A THEORETICAL AND EXPERIMENTAL PROGRAM TO INVESTIGATE WAYS TO MAKE SECOND SURFACE MIRRORS (E.G., THERMAL CONTROL SURFACES, COMPOSED OF THIN TRANSPARENT MATERIALS SUCH AS FUSED SILICA AND FEP TEFLON WITH A REFLECTIVE BACKING, WHICH ARE USED ON SPACE VEHICLES) WHICH ARE DIFFUSELY REFLECTIVE BUT WHICH RETAIN THE HIGH SOLAR REFLECTANCE OF COMMERCIAL SPECULARLY REFLECTING SECOND SURFACE MIRRORS. A NUMBER OF DESIGNS WERE SURVEYED AND FOUR DESIGNS WERE FULLY EVALUATED. THREE OF THESE DESIGNS EMPLOYED FUSED SILICA SUBSTRATES WITH FRONT OR FRONT AND BACK SURFACES GROUND WITH GRINDING COMPOUNDS AND THEN ETCHED IN A HYDROGEN FLUORIDE SOLUTION. WHEN SUITABLY SILVERED ON THE BACK SIDES, THESE SPECIMENS MET DESIGN GOALS. ONE OF THESE DESIGNS EMPLOYED A FEP TEFLON SUBSTRATE WITH FRONT AND BACK SURFACES CONTOURED BY COMPRESSION OF TEFLON SHEET BETWEEN QUARTZ PLATES IN A VACUUM OVEN. WHEN SILVERED ON THE BACK SIDE, GOOD DIFFUSENESS WAS OBTAINED BUT SOLAR REFLECTANCE WAS SLIGHTLY DEGRADED OVER THE REFLECTANCE OF COMMERCIAL TEFLON SECOND SURFACE MIRRORS. (AUTHOR)   (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLT25K

AD-A026 737   22/2   20/13   13/1
ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND)

THE PROSPERO THERMAL CONTROL SURFACES
EXPERIMENT. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
DEC 75   105P   KEYTE,G. E. ;
REPT. NO. RAE-TR-75123
MONITOR: DRIC   BR-50460

UNCLASSIFIED REPORT

DESCRIPTORS: *TEMPERATURE CONTROL, *SPACECRAFT, *SURFACE PROPERTIES, SOLAR RADIATION, EMITTANCE, INFRARED RADIATION, ULTRAVIOLET RADIATION, PERIODIC VARIATIONS, SURFACE TEMPERATURE, ROTATION, GOLD, GREAT BRITAIN. (U)
IDENTIFIERS: PROSPERO SPACECRAFT, TCSE(THERMAL CONTROL SURFACES EXPERIMENT), THERMAL CONTROL SURFACES EXPERIMENT (U)

THE PROSPERO THERMAL CONTROL SURFACES EXPERIMENT WAS CONCEIVED AS A METHOD OF INVESTIGATING THE BEHAVIOUR OF VARIOUS THERMAL CONTROL SURFACE MATERIALS IN A SPACE ENVIRONMENT. THIS REPORT CONTAINS THE RESULTS OF LABORATORY TESTS ON SELECTED MATERIALS, THE DESIGN AND CONSTRUCTION OF THE EXPERIMENT AND THE ANALYSIS OF DATA OBTAINED FROM THE FLIGHT OF THE PROSPERO SPACECRAFT. IT CONCLUDES THAT, WHILE THE EXPERIMENT WAS NOT SENSITIVE ENOUGH TO MEASURE CHANGES IN SURFACE RADIATION PROPERTIES ACCURATELY, IT WAS POSSIBLE TO IDENTIFY SOME SURFACES AS BEING SATISFACTORY FOR USE AND REJECT OTHERS AS BEING COMPLETELY UNSATISFACTORY. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLT25K

AD- 706 127 11/3 7/5
GULF GENERAL ATOMIC INC SAN DIEGO CALIF

MECHANISMS OF DEGRADATION OF POLYMERIC THERMAL
CONTROL COATINGS. PART II: EFFECTS OF RADIATION
ON SELECTED PIGMENTS. (U)

DESCRIPTIVE NOTE: FINAL REPT. 1 SEP 68-30 NOV 69,
MAR 70 113P FIRLE,TOMAS E. ;FLANAGAN,
TERRY M. ;

REPT. NO. GA-9853
CONTRACT: F33615-69-C-1055

PROJ: AF-7342
TASK: 734202
MONITOR: AFML TR-68-334-PT-2

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: SEE ALSO PART 1, AD-686 448.
PREPARED IN COOPERATION WITH GENERAL DYNAMICS/
CONVAIR, SAN DIEGO, CALIF. SPACE SCIENCES
LAB.

DESCRIPTORS: (*PIGMENTS, *DAMAGE), (*DEGRADATION,
PIGMENTS), (*COATINGS, PIGMENTS), (*SILICONES, DAMAGE),
TEMPERATURE CONTROL, RUTILE, PHOTOLYSIS, ELECTRON
IRRADIATION, SURFACE PROPERTIES, BINDERS, GAS
CHROMATOGRAPHY, STRONTIUM COMPOUNDS, TITANATES.
(U)TITANATES (U)
IDENTIFIERS: *STRONTIUM TITANATES, THERMAL CONTROL
COATINGS, *TITANIUM(IV) OXIDE (U)

AN INVESTIGATION HAS BEEN CONDUCTED ON THE
MECHANISMS OF DEGRADATION OF PIGMENTS AND POLYMERIC
COATINGS FOR THERMAL CONTROL APPLICATIONS EXPOSED TO
ULTRAVIOLET (UV) AND ELECTRON IRRADIATION. THE
MATERIALS INVESTIGATED WERE RUTILE (TITANIUM
DIOXIDE) AND STRONTIUM TITANATE (SRTIO3).
THE EFFECTS OF TREATING THE PIGMENTS BY HEATING IN
VARIOUS GAS AMBIENTS AT ELEVATED TEMPERATURES WERE
STUDIED USING GAS CHROMATOGRAPHY AND ELECTRICAL
CONDUCTIVITY MEASUREMENTS. SIGNIFICANT CHANGES IN
THE SURFACE CHARACTERISTICS WERE FOUND TO RESULT FROM
THESE TREATMENTS. A COMPARISON WAS MADE BETWEEN THE
REFLECTIVE DEGRADATION IN BINDERLESS PIGMENTS AND
SILICONE-BINDER COATINGS EXPOSED TO UV LIGHT, TO
ENERGETIC ELECTRONS, AND SIMULTANEOUSLY TO UV LIGHT
AND ELECTRONS. EVIDENCE FOR STABILIZATION OF
DEFECT SITES BY CHARGE CAPTURE WAS DISCOVERED IN THE
BINDERLESS PIGMENT EXPERIMENTS. THIS MECHANISM FOR
DEFECT STABILIZATION DOES NOT APPEAR AS PREVALENT IN
THE SILICONE-BINDER COATINGS, SINCE THE BINDER (U)

AD- 717 822 22/2 20/13
LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

THERMODYNAMICS AND THERMOPHYSICS OF SPACE FLIGHT PROCEEDINGS HELD AT PALO ALTO, CALIFORNIA ON MARCH 23-25, 1970. (U)

DESCRIPTIVE NOTE: FINAL REPT.,
JAN 71 296P COHAN,HENRY ;CALVERT,D. L. ;SATTERLEE,H. M. ;
CONTRACT: F44620-69-C-0120
PROJ: AF-9781
TASK: 978101
MONITOR: AFOSR TR-71-0079

UNCLASSIFIED REPORT
AVAILABILITY: PAPER COPY AVAILABLE FROM WESTERN PERIODICALS COMPANY, 1300 RAYMER ST., NORTH HOLLYWOOD, CALIF. 91605. $17.00.

DESCRIPTORS: (*SPACECRAFT, *TEMPERATURE CONTROL), (*SPACE FLIGHT, THERMODYNAMICS), SYMPOSIA, SOLAR RADIATION, MATHEMATICAL MODELS, SURFACE PROPERTIES, PERTURBATION THEORY, OPTICS, SATELLITES(ARTIFICIAL), ANTENNAS, COMPUTER PROGRAMMING, MATERIALS, THERMAL INSULATION, LIFTING REENTRY VEHICLES (U)

THE NEWLY DEVELOPED ENGINEERING SCIENCE OF SPACECRAFT TEMPERATURE CONTROL CONTINUES TO CHANGE AT A RAPID PACE. AS A MEANS OF ASSISTING AND ENCOURAGING THE DISEMINATION OF NEW DEVELOPMENTS A SYMPOSIUM WAS HELD AT THE LOCKHEED RESEARCH LABS. IN 1970. THE SYMPOSIUM WAS JOINTLY SPONSORED BY THE AIR FORCE OFFICE OF SCIENTIFIC RESEARCH AND THE LOCKHEED MISSILES AND SPACE CO. THE TECHNICAL PROGRAM OF 17 PAPERS IN FOUR BROAD CATAGORIES COMPRISES THE CONTENTS OF THIS VOLUME. FOUR GENERAL CLASSES OF PAPERS ARE PRESENTED: NEW COMPUTATIONAL TECHNIQUES WITH COMPLEX COMPUTER DESIGN AND OPTIMAL CONTROL THEORY; POINT DESIGNS FOR A SOLAR ARRAY, AN ANTENNA AND AN OPTICS SYSTEM; THERMAL CONTROL TECHNIQUES FOR ENERGY EXCHANGE WITH HIGH FLUX RATES, PASSIVE SYSTEMS AND COOLANT LOOP SYSTEMS DESIGN; AND MATERIALS DEVELOPMENT WITH SPECIAL COATINGS AND INSULATIONS FOR SPACECRAFT SURFACES.
(AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLT?5K

AD- 782 093 22/2
AVCO SYSTEMS DIV WILMINGTON MASS

DETERMINATION OF SATELLITE OBSERVABLES.
VOLUME IV. OPTICAL PROPERTIES OF SATELLITE
MATERIALS. (U)

DESCRIPTIVE NOTE: FINAL REPT. 24 APR 72-12 NOV 73.
MAY 74 302P BAIR,M. E. ;CARMER,D. ;
ZUK,D. ;SUITS,G. ;

REPT. NO. AVSD-0085-74-CR-VOL-4
CONTRACT: F04701-72-C-0353
MONITOR: SAMSO TR-73-291-VOL-4

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: PREPARED IN COOPERATION WITH
ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN
ARBOR, CONTRACT F04701-72-C-0360.

DESCRIPTORS: *SPACECRAFT COMPONENTS, OPTICAL
PROPERTIES, SOLAR CELLS, TEMPERATURE CONTROL,
MIRRORS, PAINTS, TAPES, ALUMINUM COATINGS,
REFLECTIVITY, EMISSIVITY, SURFACE PROPERTIES,
INFRARED SPECTRA, DATA PROCESSING,
INSTRUMENTATION, MEASUREMENT, GRAPHICS,
SATELLITE TRACKING SYSTEMS (U)

THE OPTICAL PROPERTIES OF SELECTED SATELLITE
SURFACE MATERIALS WERE MEASURED; THESE MATERIALS
INCLUDED SOLAR CELLS, THERMAL CONTROL MIRRORS,
REFLECTIVE TAPE, AND VARIOUS PAINTED SURFACE. ALL
SAMPLES WERE PREPARED USING ACTUAL VEHICLE SUBSTRATES
AND FLIGHT TEST ASSEMBLY PROCEDURES. MEASUREMENT
DATA REPORTED INCLUDE: (1) SPECTRAL
DIRECTIONAL REFLECTANCE AND/OR EMITTANCE OVER THE
UV0.24- TO IR22- MICROMETERS SPECTRAL RANGE;
(2) BIDIRECTIONAL REFLECTANCE AT COHERENT
WAVELENGTHS OF 0.63, 1.06 AND 10.6 MICROMETERS AND A
VISIBLE SOLAR SIMULATION BAND EXTENDING FROM 0.4 TO
0.7 MICROMETERS; AND (3) SURFACE DISTRIBUTION
INFORMATION ON SAMPLES HAVING A SIGNIFICANT SPECULAR
COMPONENT -- GIVEN AS DIRECTION NORMAL ORIENTATION OF
INDIVIDUAL SAMPLE ELEMENTS. INSTRUMENTATION
MEASUREMENT TECHNIQUES ARE DISCUSSED, AND THE
RESULTS, SHOWING SIGNIFICANT SPECULAR RETURNS FROM
SOLAR CELLS, ARE PRESENTED IN TABULAR OR GRAPHICAL
FORMAT. DATA INTERPRETATION AND VARIABILITY ARE
ALSO DISCUSSED. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLT25K

AD- 813 766L   21/2   20/4   11/3
NORTH AMERICAN AVIATION INC DOWNEY CALIF SPACE AND INFORMATION SYSTEMS DIV

ATTITUDE CONTROL ROCKET EXHAUST PLUME EXPERIMENT. SPECIAL REPORT. (U)

DESCRIPTIVE NOTE: REPT. FOR 28 FEB-28 APR 67,
MAY 67 61P BOUDREAUX,RODNEY A. ; ETHERIDGE,FREDERICK G. ;
REPT. NO. SID-67-499
CONTRACT: AF 04(611)-11542
PROJ: AF-6753
MONITOR: AFRPL TR-67-90

UNCLASSIFIED REPORT
DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY; TEST AND EVALUATION; AUG 71. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO DIRECTOR, AIR FORCE ROCKET PROPULSION LABORATORY, ATTN: RPPR-STINFO. EDWARDS AIR FORCE BASE, CALIF. 93523.
SUPPLEMENTARY NOTE: SEE ALSO REPT. NO. SID-67-22 DATED FEB 67, AD-807 996.

DESCRIPTORS: (*ATTITUDE CONTROL SYSTEMS, *EXHAUST GASES), (*SPACECRAFT, PROTECTIVE TREATMENTS), SURFACES, TEMPERATURE CONTROL, PRESSURE, DEGRADATION, STABILITY, HEAT TRANSFER, ZINC COATINGS, PROPELLANT TANKS, SOLAR RADIATION, STAINLESS STEEL, THERMOCOUPLES, ELECTRIC INSULATION, SANDWICH CONSTRUCTION, SANDWICH PANELS, SPACE PROPULSION, SPACE ENVIRONMENTS, CONFIGURATION, SPIN STABILIZATION (U)
IDENTIFIERS: APOLLO, PLUMES(RADIATION), STEEL 1050, SURVEYOR, TETRAFLUOROETHYLENE RESINS (U)

THE OVERALL OBJECTIVE OF THE PROGRAM IS TO PERFORM SUITABLE IN-FLIGHT EXPERIMENTS IN SPACE TO DETERMINE THE NATURE AND MAGNITUDE OF THE EXHAUST PLUME IMPINGEMENT EFFECTS ON SPACECRAFT FUNCTIONAL SURFACES. THE WORK DISCUSSED IN THIS SPECIAL REPORT IS RELATED TO DEFINITION OF A SUITABLE SPACE PROPULSION SYSTEM WHICH WILL FUNCTION AS THE PLUME SOURCE, CONDUCTING STUDIES RELATED TO THE INTEGRATION OF THE EXPERIMENT AND THE OV1 VEHICLE, PERFORMING A THERMAL ANALYSIS ON THE EXPERIMENT AND ASSOCIATED ON-BOARD EQUIPMENT, AND PLANNING A STABILITY AND CONTROL STUDY TO ASSURE THAT THE VEHICLE WILL BE ORIENTED IN SPACE IN A MANNER WHICH WILL PERMIT THE SUCCESSFUL EXECUTION OF THE EXPERIMENT. THE RESULTS OF THE STUDY ARE: (1) FLIGHT RATED PROPELLANT SYSTEMS SUITABLE FOR THE IN-SPACE EXPERIMENT HAVE BEEN IDENTIFIED. SEVERAL ROCKET ENGINES WITH (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLT25K

AD- 820 690 22/2 20/13
TRW SYSTEMS REDONDO BEACH CALIF

THERMAL TEST OF A MODEL SPACE VEHICLE. PART I.
DESCRIPTION AND THERMAL ANALYSIS OF MODEL. (U)

DESCRIPTIVE NOTE: TECHNICAL REPT.,
JUN 67 228P CLAUSEN,O. W. ;ISHIMOTO,T.
;
CONTRACT: AF 33(615)-5330
PROJ: AF-6146
TASK: 614617
MONITOR: AFFDL TR-67-42-PT-1

UNCLASSIFIED REPORT
DISTRIBUTION: NO FOREIGN WITHOUT APPROVAL OF AIR FORCE FLIGHT DYNAMICS LAB., ATTN: FDFE. WRIGHT-PATTERSON AFB, OHIO 45433.

DESCRIPTORS: (*SPACECRAFT, HEAT TRANSFER), (*PANELS, *HEAT TRANSFER), MODEL TESTS, ORBITS, THERMAL ANALYSIS, DIFFERENTIAL THERMAL ANALYSIS, TEMPERATURE CONTROL, THERMAL RADIATION, CONDUCTION(HEAT TRANSFER), MODELS(SIMULATIONS), THERMAL DIFFUSION, DESIGN, SURFACE TEMPERATURE, COMPUTER PROGRAMMING, STATISTICAL ANALYSIS, COLORS (U)

THE WORK DESCRIBED IN THIS REPORT IS THE SECOND PHASE OF AN AFFDL PROGRAM DIRECTED AT IMPROVING THE UNDERSTANDING AND PREDICTION OF ORBITING SPACECRAFT THERMAL PERFORMANCE. THE INITIAL ASPECT OF THE PRESENT PROGRAM CONSISTED OF THE DESIGN AND CONSTRUCTION OF A MODEL SPACECRAFT WHOSE RADIATIVE EXCHANGE CHARACTERISTICS WERE ARRANGED TO EMPHASIZE THE VARIANCE BETWEEN DIFFUSE AND STRONGLY NON-DIFFUSE SURFACES IN AN ENCLOSURE. THE MODEL VEHICLE WAS DIVIDED INTO THREE COMPARTMENTS ONE OF WHICH HAD ALL SURFACES COATED WITH A DIFFUSE COATING. THE OTHER TWO COMPARTMENTS EACH HAD A NUMBER OF HIGHLY SPECULAR SURFACES AND SIGNIFICANT DIFFERENCES BETWEEN THE DIFFUSE AND SPECULAR-DIFFUSE ANALYSIS WERE COMPUTED. RESULTS OF THE SPACECRAFT THERMAL ANALYSIS, USING THE DIFFUSE ASSUMPTION WERE COMPARED TO RESULTS OBTAINED USING THE SPECULAR-DIFFUSE TECHNIQUE DEVELOPED IN AFFDL-TR-65-139 AND THE AREAS OF DIFFERENCES NOTED. AN EXTENSIVE EVALUATION WAS UNDERTAKEN TO ASCERTAIN THE UNCERTAINTIES ASSOCIATED WITH EACH OF THE ANALYSIS 'MODELS' IN THEIR PREDICTION OF TEMPERATURES: THIS WORK CONSTITUTES THE FIRST STEPS IN THE GENERATION OF A GENERALIZED PROCEDURE FOR ERROR OR UNCERTAINTY ANALYSIS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLT25K

AD- 905 160 22/2
BUNDESMINISTERIUM FUER WISSENSCHAFTLICHE FORSCHUNG BONN (WEST GERMANY)

ENTWICKLUNGSARBEITEN AN EINEM HALBAKTIVEN TEMPERATUR-REGELSYSTEM TEIL II: ENTWICKLUNG UND ERPROBUNG VON BLENDENSYSTEMEN (DEVELOPMENT OF SEMIACTIVE CONTROL SYSTEM. PART II. DEVELOPMENT AND TEST OF LOUVER SYSTEMS). (U)

DESCRIPTIVE NOTE: FORSCHUNGSBERICHT,
NOV 68 77P BEY,R. ;HERMANN,E. ; KALKBRENNER,B. ;SINREICH,G. ;
REPT. NO. BMWF-FB-W-68-75

UNCLASSIFIED REPORT

DISTRIBUTION: DDC USERS ONLY.
SUPPLEMENTARY NOTE: TEXT IN GERMAN; SUMMARY AND REFERENCES IN ENGLISH.

DESCRIPTORS: (*SATELLITES(ARTIFICIAL), *TEMPERATURE CONTROL), SPACECRAFT COMPONENTS, DETECTORS, TEMPERATURE, SURFACES, SOLAR RADIATION, PROTECTIVE COVERINGS, THERMAL RADIATION, ABSORPTION, REFLECTION, SURFACE TEMPERATURE, WEST GERMANY (U)
IDENTIFIERS: LOUVERS, SEMIACTIVE TEMPERATURE CONTROL (U)

TEMPERATURE FLUCTUATIONS IN SATELLITES CAN BE REDUCED EASILY AND RELIABLY BY SEMIACTIVE TEMPERATURE CONTROL SYSTEMS, THAT IS TO SAY, ALTERNATING THE RADIATION PROPERTIES OF THE SURFACE. TEMPERATURE SENSIBLE REGULATION SYSTEMS REQUIRE OPEN AND SHUT MOVEABLE COVERINGS OF LITTLE ABSORPTANCE ARRANGED ABOVE SURFACES OF HIGH EMITTANCE. THIS REPORT DESCRIBES THE DEVELOPMENT AND TEST OF SUCH A SYSTEM AND ITS SINGLE COMPONENTS. SEMIACTIVE TEMPERATURE CONTROL CAN BE OBTAINED BY USING ONE OR TWO TEMPERATURE SENSORS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLT25K

AD- 907 411L 20/13 22/2 5/2
LOCKHEED MISSILES AND SPACE CO PALO ALTO CALIF

CONTAMINATION AND DEGRADATION OF THERMAL CONTROL AND OPTICAL SURFACES: AN ANNOTATED BIBLIOGRAPHY. (U)

DESCRIPTIVE NOTE: LITERATURE SEARCH 1971-1972,
JAN 73 100P ABBOTT,HELEN M. ;

REPT. NO. LMSC-LS-73-1

UNCLASSIFIED REPORT
DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY. OTHER REQUESTS FOR THIS DOCUMENT MUST BE REFERRED TO LOCKHEED MISSILES AND SPACE CO. ATTN: TECHNICAL INFORMATION CENTER, PALO ALTO, CALIF. 94304.

DESCRIPTORS: (*TEMPERATURE CONTROL, SATELLITES(ARTIFICIAL)), (*OPTICAL MATERIALS, BIBLIOGRAPHIES), SURFACE PROPERTIES, DEGRADATION, CONTAMINATION, THERMAL INSULATION, THERMAL CONDUCTIVITY, OPTICAL COATINGS, REFLECTIVITY, FINISHES (U)
IDENTIFIERS: *OPTICAL SURFACES, *THERMAL CONTROL COATINGS (U)

THIS COMPILATION CONTAINS SELECTED REFERENCES OBTAINED FROM A LITERATURE SEARCH FOR INFORMATION PERTAINING TO THE PROBLEMS OF CONTAMINATION AND DEGRADATION OF THERMAL CONTROL OR OPTICAL SURFACES OF ORBITING VEHICLES. INCLUDED ARE THEORETICAL STUDIES, FLIGHT AND LABORATORY DATA. THE ABSTRACTS ARE ARRANGED ALPHABETICALLY BY AUTHOR OR TITLE AND REPRESENT A COVERAGE OF THE 1971-1972 LITERATURE. MACHINE SEARCHES OF THE NASA AND DDC FILES WERE REVIEWED. AN AUTHOR, CORPORATE SOURCE AND A SUBJECT INDEX HAVE BEEN INCLUDED TO ASSIST IN LOCATING SPECIFIC DATA WHENEVER THE NEED OCCURS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY   SEARCH CONTROL NO. CLT25K

AD- 922 801L   11/3   22/2   16/3
SPAR AEROSPACE PRODUCTS LTD MALTON (ONTARIO)

CTS: THERMAL CONTROL SURFACE PROPERTIES
MEASUREMENT, (U)

MAY 73   27P   BELL,J. F. ;
REPT. NO. SPAR-R.555
MONITOR: GIDEP 347.65.00.00-CL-01

UNCLASSIFIED REPORT
DISTRIBUTION LIMITED TO U.S. GOV'T. AGENCIES ONLY;
TEST AND EVALUATION; 20 SEP 74. OTHER REQUESTS FOR
THIS DOCUMENT MUST BE REFERRED TO OFFICER-IN-CHARGE
(CODE 862), FLEET MISSILE SYSTEMS ANALYSIS AND
EVALUATION GROUP ANNEX, ATTN: GIDEP
ADMINISTRATION OFFICE, CORONA, CALIF. 91720.
AVAILABILITY: MICROFICHE COPIES ONLY.

DESCRIPTORS: (*SPACECRAFT, COATINGS),
(*COATINGS, TEMPERATURE CONTROL), (*SURFACE
TEMPERATURE, TEMPERATURE CONTROL), SURFACE
PROPERTIES, ABSORPTION(PHYSICAL), EMISSIVITY,
HEAT SHIELDS, AIRFRAMES, ALUMINUM, FIBERGLASS,
GLASS, LAMINATES, REINFORCED PLASTICS, STAINLESS
STEEL, PAINTS, TETRAFLUOROETHYLENE RESINS, GOLD,
OPTICAL PROPERTIES (U)
IDENTIFIERS: TEFLON, KAPTON (U)

THIS REPORT LISTS THERMAL CONTROL SURFACE
PROPERTIES MEASUREMENTS MADE AT SPAR TO VERIFY THAT
ABSORPTIVITY AND EMISSIVITY VALUES OF MATERIALS USED
IN THE CTS THERMAL SUBSYSTEM DESIGN ARE IN
AGREEMENT WITH ANALYTICAL VALUES USED. COMPARISONS
OF MEASURED VALUES ARE IN SUBSTANTIAL AGREEMENT WITH
EARLIER ASSUMED VALUES. REPORTED ALSO ARE
MEASUREMENTS MADE BY NASA-GSFC ENGINEERING
APPLICATIONS BRANCH ON REPRESENTATIVE SAMPLES OF
CTS THERMAL CONTROL SAMPLES MOUNTED IN THE SES
CHAMBER DURING THERMAL VACUUM TESTING. IT IS
CONCLUDED THAT THE MATERIALS USED WILL BE
SATISFACTORY FOR THERMAL SUBSYSTEM DESIGNS OF ALL
CTS SPACECRAFT MODELS. (AUTHOR) (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CLT25K

AD-A017 502 13/11 20/13
AEROSPACE CORP EL SEGUNDO CALIF CHEMISTRY AND PHYSICS
LAB

LUBRICANT RESERVOIR SYSTEMS: THERMAL
CONSIDERATIONS. (U)

DESCRIPTIVE NOTE: INTERIM REPT.,
OCT 75 18P DORMANT,LEON M. ;FEUERSTEIN,
SEYMOUR ;

REPT. NO. TR-0076(6270-30)-1
CONTRACT: F04701-75-C-0076
MONITOR: SAMSO TR-75-239

UNCLASSIFIED REPORT

DESCRIPTORS: *OIL RESERVOIRS, *LUBRICANTS,
*RESERVOIRS, *BEARINGS, THERMODYNAMICS,
LUBRICATION, REPLENISHMENT, NYLON, CAPILLARITY,
TRANSPORT PROPERTIES, TEMPERATURE CONTROL,
GRADIENTS, HEAT, METHODOLOGY, POROUS MATERIALS,
SURFACE PROPERTIES, SURFACE TEMPERATURE,
INTERFACIAL TENSION, HEAT OF VAPORIZATION,
SPACECRAFT, SPACEBORNE, FEEDING, SURFACES,
PRESSURE, MECHANICAL COMPONENTS, LAPLACE
TRANSFORMATION, TEMPERATURE (U)
IDENTIFIERS: KELVIN EQUATION (U)

THE THERMAL CONDITIONS NECESSARY TO ENSURE THAT POROUS NYLON LUBRICANT RESERVOIRS PROPERLY FUNCTION AS LUBRICANT REPLENISHMENT SOURCES ARE DERIVED BY THERMODYNAMIC METHODOLOGY. THE POROUS NYLON MUST BE WARMER THAN ITS SURROUNDINGS BY AT LEAST AN AMOUNT DELTA T, WHICH MAY BE EXPRESSED BY THE RELATION DELTA T=-2 GAMMA V T SUB B RH WHERE T SUB B IS THE SYSTEM TEMPERATURE, R IS THE NYLON PORE RADIUS, AND GAMMA, V, AND H ARE THE SURFACE TENSION, THE MOLAR VOLUME, AND THE MOLAR HEAT OF VAPORIZATION OF THE LIQUID LUBRICANT, RESPECTIVELY. (U)

DDC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. CL-25K

AD- 507 986L 22/2
LOCKHEED MISSILES AND SPACE CO SUNNYVALE CALIF

DESIGN AND ANALYSIS OF THE FDL-5 REUSABLE SPACECRAFT. VOLUME 1. SUMMARY. (U)

DESCRIPTIVE NOTE: FINAL TECHNICAL REPT. JUL 67-DEC 69.
DEC 69 116P LLOYD,J. T. ;ALEXANDER,G. L. ;DECAMP,R. W. ;DRAPER,A. C. ;COSENZA, C. J. ;
CONTRACT: F33615-67-C-1885
PROJ: AF-1366
MONITOR: AFFDL TR-69-94-VOL-1

UNCLASSIFIED REPORT
DISTRIBUTION: DOD ONLY: OTHERS TO DIRECTOR, AIR FORCE FLIGHT DYNAMICS LAB., ATTN: FDMS. WRIGHT-PATTERSON AFB, OHIO 45433.
SUPPLEMENTARY NOTE: SEE ALSO VOLUME 2, AD-507 987L.

DESCRIPTORS: (*SPACECRAFT, DESIGN), SPACECRAFT COMPONENTS, SURFACE TEMPERATURE, AERODYNAMIC CHARACTERISTICS, STRUCTURAL PROPERTIES, STABILITY, LIFT, AERODYNAMIC LOADING, AERODYNAMIC CONFIGURATIONS, DRAG, FLIGHT CONTROL SYSTEMS, AERODYNAMIC HEATING, ATMOSPHERE ENTRY, WEIGHT, ASCENT TRAJECTORIES, AIRFRAMES, POWER SUPPLIES (U) *MANEUVERING SATELLITES, *MANNED SPACECRAFT, *BOOST GLIDE VEHICLES, INERTIAL NAVIGATION, POLAR ORBIT TRAJECTORIES, MILITARY SATELLITES, LIFTING REENTRY VEHICLES, LAUNCH VEHICLES, PAYLOAD, SUBSONIC CHARACTERISTICS, TEMPERATURE CONTROL, FLUORINE, LANDING, HYDROGEN, VARIABLE SWEEP WINGS, LIQUID PROPELLANT ROCKET ENGINES (U)
IDENTIFIERS: FDL-5LC SPACECRAFT, *FDL-5 SPACECRAFT, *REUSABLE SPACECRAFT, TITAN 3 (U)

ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF A REUSABLE, MANNED, PAYLOAD-CARRYING UPPER STAGE SPACECRAFT WITH A VARIABLE GEOMETRY WING HAS LED TO THE SELECTION OF A BENCHMARK CONFIGURATION (FDL-5LC). THE INVESTIGATION HAS EVALUATED THE AERODYNAMIC, AEROTHERMODYNAMIC, STABILITY, AND CONTROL CHARACTERISTICS OF THE SELECTED CONFIGURATION. THE OPERATIONAL AND FUNCTIONAL CHARACTERISTICS, AS WELL AS THE SENSITIVITY FACTORS OF KEY PARAMETERS, ARE DESCRIBED IN DETAIL IN THIS FINAL REPORT. STRUCTURAL DESIGN APPROACHES AND SUBSYSTEMS CONFIGURATIONS ARE ALSO DESCRIBED. THE BENCHMARK CONFIGURATION IS SHOWN TO BE STABLE AND TRIMMABLE THROUGHOUT THE ENTIRE FLIGHT REGIME. A SIGNIFICANT STABILITY MARGIN IS AVAILABLE THROUGHOUT(U)

GENERAL REPORT SUMMARY SHEET

1. COMPONENT/PART NAME PER GENERIC CODE: General Technical Data, Radiation Effects on Parts and Materials	2. PROGRAM OR WEAPON SYSTEM: Multiple
4. ORIGINATOR'S REPORT TITLE: Proton and Electron Effects in Thermal Control Materials	3. D5826 — TEST COMPL: - - - ; RPT COMPL: - 05 70
	5. ORIGINATOR'S REPORT NO.: None
	6. TEST TYPE, ETC: Radiation Effects

7. THIS TEST (SUPERSEDES) (SUPPLEMENTS) REPORT NO None

8. OUTLINE, TABLE OF CONTENTS, SUMMARY, OR EQUIVALENT DESCRIPTION

ABSTRACT

This document is the final report of experimental and analytical work performed for NASA-Goddard Space Flight Center under Contract NAS5-11219. The effects of 35-keV electrons and 40-keV protons on the reflectance and degradation properties of selected specular and diffuse thermal control materials tested at room temperatures have been studied and compared. FEP Teflon, Alzak, Kapton, and diffuse white paints have been emphasized. Exposure rates on the order of 10^{10} particles/cm^2-second have been used. Reflectance measurements between 0.24 and 2.54 microns wavelength have been made *in situ* on test specimens at various exposure levels up to about 2×10^{16} particles/cm^2. Plots of the materials' reflectance properties as a function of wavelength have been obtained with computer processing of test data, and are presented. Comparison of the proton and electron exposure results shows that four different types of spectral reflectance degradation characteristics obtain in the 18 types of materials tested in both particle environments. Plots showing these damage classifications are included, and coatings offering best solar absorptance stability (such as 2-mil silvered Teflon) are identified. A coating temperature study, a proton energy study, combined particle-ultraviolet radiation studies, and *in situ* capability for coating emittance measurements following exposure to charged particles are recommended as being important for future effort and understanding.

KEY WORDS

COATINGS, RADIATION EFFECTS
DEGRADATION TESTS
MATERIALS, THERMAL CONTROL
RADIATION EFFECTS
THERMAL CONTROL MATERIALS

D5826

11. REPT NO 347.65.00.00-06-33

03 MAR 1970

9. SIGNED	10. CONTRACTOR	SUBCONTRACTOR
D.C.	The Boeing Co.	

SD2-5025-0-10 ORI 9-68 (2-5060-0-2)

GIDEP Form 2-12-71 GENERAL REPORT SUMMARY SHEET

1. ORIGINATOR'S REPORT TITLE	2. PROGRAM OR SYSTEM	3. DATE OF	DAY	MO.	YR.
SKYLAB D024 THERMAL CONTROL COATING AND POLYMERIC FILMS EXPERIMENT	Space	ISSUE	—	3	75
	4. ORIGINATOR'S REPORT NO. APML-TR-75-77	REVISION	—	—	—
5. ORIGINATOR'S PART NAME/PART IDENTIFICATION: N/A	6. REPORT TYPE ETC. Research				

7. THIS TEST (SUPERSEDES) (SUPPLEMENTS) REPORT NO. None

8. MANUFACTURER	9. MANUFACTURER PART NO.	10. OPERATING, RATINGS, SIZE, ETC.
N/A	N/A	N/A

11. OUTLINE, TABLE OF CONTENTS SUMMARY OR EQUIVALENT DESCRIPTION

Preliminary results of an experiment designed to determine the effects of the external Skylab space environment on the performance and properties of a wide variety of selected thermal control coatings and polymeric films are presented. Three duplicate sets of thermal control coatings and polymeric films were exposed to the Skylab space environment for varying periods of time during the mission. The specimens were retrieved by the Astronauts, placed in hermetically sealed return containers during EVA, recovered, and returned to the Air Force Materials Laboratory for analysis and evaluation. Post flight analysis of the three sets of recovered thermal control coatings indicated that measured changes in specimen thermooptical properties are due to a combination of excessive contamination and solar degradation of the contaminant layer. The degree of degradation experienced overrides, obscures and compromises the measurement of the degradation of the substrate coatings themselves. Preliminary experimental results on the analysis of the contamination are also presented.

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

12. ENVIRONMENTAL EXPOSURE CODES — — — —

13. MANUFACTURER NOTIFIED: N/A (DAY / MONTH / YEAR)

14. KEY WORDS FOR INDEXING Thermal Control Coating, Skylab, Spacecraft Coatings, Satellite Experiment, Contamination, Coatings, Space Environmental Stability

15. SIGNATURE
Eric L. Pohlen
10 NOVEMBER 1975

16. PARTICIPANT
USAF, ASD/ENYS
Wright-Patterson AFB, OH 45433

18. COMPONENT PART NAME PER GIDEP CODE: Finishes and Surface Treatments, Vacuum Deposition, Thermally Insulative, SOC, Metallic, SOC

19. REPORT NO. 331.95.37.10-G7-01

E046-0915

GENERAL REPORT SUMMARY SHEET

1 OF 1

1 ORIGINATOR'S REPORT TITLE	2 PROGRAM OR SYSTEM	3 DATE OF	DAY	MO	YR
Contamination and Degradation of Spacecraft Systems An Annotated Bibliography	C.F.	TEST COMPL.	.	.	.
	5 ORIGINATOR'S REPORT NO. LMSC LS-76-1	REPT COMPL.	01	03	76

4 ORIGINATOR'S PART NAME/PART IDENTIFICATION	6 REPORT TYPE ETC
N/A	GENERAL TECHNICAL DATA

7 THIS TEST SUPPLEMENTS REPORT NO 347.10.00 00-S3-02 (LMSC LS-73-1)
347.10.00.00-S3-03 (LMSC-LS-73-1, Suppl.)

8 MANUFACTURER	9 MANUFACTURER PART NO	10. MFG-TYPE, RATING, SIZE, ETC.
N/A	N/A	N/A

11 OUTLINE TABLE OF CONTENTS, SUMMARY OR EQUIVALENT DESCRIPTION

347.95.00.00-S3-CR

ABSTRACT

THIS COMPILATION OF SELECTED REFERENCES REPRESENTS A CONTINUATION OF LITERATURE SURVEILLANCE FOR DATA AND INFORMATION PERTAINING TO THE CONTAMINATION AND DEGRADATION OF SPACECRAFT SYSTEMS AND SURFACES. INCLUDED ARE THEORETICAL, FLIGHT AND LABORATORY DATA. THESE ABSTRACTS PROVIDE A COVERAGE OF THE LITERATURE FROM 1973 THROUGH FEB. 1976. REFERENCES ARE ARRANGED ALPHABETICALLY BY AUTHOR OR TITLE. A CORPORATE SOURCE AND A SUBJECT INDEX ARE INCLUDED TO ASSIST IN LOCATING SPECIFIC ITEMS.

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12 COMPONENT PART NAME PER GENERIC CODE: General Technical Data, Bibliographies, List, Indexes of Publications of Parts

13 REPORT NUMBER: 347.10.00.00-S3-01

E053-0848

14 N/A

LOCKHEED MISSILES & SPACE CO.

GOVERNMENT-INDUSTRY DATA EXCHANGE PROGRAM

GENERAL REPORT SUMMARY SHEET

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1 OF 1

1 ORIGINATOR'S REPORT TITLE: CONTAMINATION AND DEGRADATION OF SPACECRAFT SYSTEMS: AN ANNOTATED BIBLIOGRAPHY	2 PROGRAM OR SYSTEM: C.F.	3. DATE OF	DAY	MO	YR
		TEST COMPL.	-	-	-
	5 ORIGINATOR'S REPORT NO: LS-76-1, SUPPL. 1	REPT COMPL.	20	12	76
4 ORIGINATOR'S PART NAME/PART IDENTIFICATION: N/A	6 REPORT TYPE, ETC: GENERAL TECHNICAL DATA				

7 THIS TEST (SUPPLEMENTS) REPORT NO: Multiple See Box 11

8 MANUFACTURER	9 MANUFACTURER PART NO	10. MFG-TYPE, RATING SIZE ETC.
N/A	N/A	N/A

11 OUTLINE TABLE OF CONTENTS SUMMARY, OR EQUIVALENT DESCRIPTION: 347.95.00.00-S3-CR

ABSTRACT

This compilation of selected references represents a continuation of literature surveillance for data and information pertaining to the contamination and degradation of spacecraft systems and surfaces. Included are theoretical, flight and laboratory data.

These abstracts provide a coverage of the literature from March 1976 to September 1976. Earlier information can be found in reports - LMSC LS 76-1, LMSC LS 73-1 and LMSC LS 73-1, Suppl.1.

The references are arranged alphabetically by author or title. A corporate source and subject index are included to assist in locating specific items.

Box 7

347.10.00.00-S3-01	L053-0848
347.10.00.00-S3-02	L054-2064
347.10.00.00-S3-03	L054-2066
347.10.00.00-S3-04	L054-2068

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12 ENVIRONMENTAL EXPOSURE CODES	13 MANUFACTURER NOTIFIED (Day, Month, Year)
N/A	None

14 KEY WORDS FOR INDEXING: Contamination, Spacecraft Systems, Laser Induced Damage, Outgassing, Radiation, Electrostatic, Degradation,

15 SIGNATURE	16 PARTICIPANT
	LOCKHEED MISSILE SYSTEMS DIVISION (S3)

17 ACCESS NUMBER: 2008-1386

18. COMPONENT PART NAME PER GENERIC CODE: General Technical Data, Bibliographies, List, Indexes of Publications of Parts

19. REPORT NUMBER: 347.10.00.00-S3-05

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1386

OMB NO. 22-R0336

GOVERNMENT-INDUSTRY DATA EXCHANGE PROGRAM

GENERAL REPORT SUMMARY SHEET

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1 OF 1

1 ORIGINATOR'S REPORT TITLE	2 PROGRAM OR SYSTEM	3. DATE OF	DAY	MO	YR
Contamination and Degradation of Spacecraft Surfaces: An Annotated Bibliography	C.F.	TEST COMPL.	–	–	–
	5 ORIGINATOR'S REPORT NO. LMSC LS-73-1, Suppl	REPT COMPL.	01	05	73

4 ORIGINATOR'S PART NAME/PART IDENTIFICATION	6 REPORT TYPE, ETC.
N/A	GENERAL TECHNICAL DATA

7. THIS TEST (SUPERSEDES)(SUPPLEMENTS) REPORT NO.
347.10.00.00-S3-01 (E053-0848); 347.10.00.00-S3-02 (E054-2064)

8. MANUFACTURER	9. MANUFACTURER PART NO.	10. MFG-TYPE, RATING, SIZE, ETC.
N/A	N/A	N/A

11 OUTLINE, TABLE OF CONTENTS, SUMMARY, OR EQUIVALENT DESCRIPTION

347.95.00.00-S3-CR

This Compilation of Selected References represents a Continuation of Literature Surveillance for Data and information pertaining to problems of Contamination and Degradation of Spacecraft Surfaces and provides a coverage of the Literature from January through May 1973, which supplements earlier information contained in LMSC LS 73-1.

The abstracts are arranged alphabetically by author or title. An author, Corporate Source and a Subject Index have been included to assist in locating specific items.

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12 ENVIRONMENTAL EXPOSURE CODES	13. MANUFACTURER NOTIFIED (Day, Month, Year)
N/A	N/A

14 KEY WORDS FOR INDEXING

Optical Surfaces, Thermal Coatings, Coatings

15 SIGNATURE	16. PARTICIPANT
	LOCKHEED MISSILE SYSTEMS DIV. (S3)

17. ACCESS NUMBER E054-2066

18. COMPONENT PART NAME PER GENERIC CODE: General Technical Data, Bibliographies, List, Indexes of Publications of Parts

19. REPORT NUMBER 347.10.00.00-S3-03

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E054-2066

1

OMB NO. 22-R0330

GOVERNMENT-INDUSTRY DATA EXCHANGE PROGRAM

GENERAL REPORT SUMMARY SHEET

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1 OF 1

1. ORIGINATOR'S REPORT TITLE	2. PROGRAM OR SYSTEM	3. DATE OF	DAY	MO	YR
Contamination and Degradation of Thermal Control and Optical Surfaces: An Annotated Bibliography	C.P.	TEST COMPL.	--	--	--
	4. ORIGINATOR'S REPORT NO. LMSC LS-73-1	REPT COMPL.	15	01	73

5. ORIGINATOR'S PART NAME/PART IDENTIFICATION	6. REPORT TYPE, ETC
None	GENERAL TECHNICAL DATA

7. THIS TEST (SUPPLEMENTS) REPORT NO.

347.10.00.00-83-01 (E053-0848); 347.10.00.00-83-03 (E054-2066)

8. MANUFACTURER	9. MANUFACTURER PART NO.	10. SPEC/TYPE, RATING, SIZE, ETC.
N/A	N/A	N/A

11. OUTLINE, TABLE OF CONTENTS, SUMMARY, OR EQUIVALENT DESCRIPTION

347.95.00.00-83-CR

This Compilation contains selected References obtained from a Literature Search for information pertaining to the problems of Contamination and Degradation of Thermal Control or Optical surfaces of orbiting vehicles. Included are Theoretical studies, Flight and Laboratory Data.

The Abstracts are arranged alphabetically by author or title and represents a coverage of the 1971-1972 Literature. Machine searches of the NASA and DDC files were reviewed.

An author, corporate source and a subject Index have been included to assist in locating Specific Data whenever the need occurs.

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12. ENVIRONMENTAL EXPOSURE CODES	13. MANUFACTURER NOTIFIED (Day, Month, Year)
N/A	N/A

14. KEY WORDS FOR INDEXING

Spacecraft Surfaces, Radiation Effects, Orbiting Vehicles

15. SIGNATURE	16. PARTICIPANT
	LOCKHEED MISSILE SYSTEMS DIV. (83)

17. ACCESS NUMBER E054-2066

18. COMPONENT PART NAME PER GENERAL CODE

General Technical Data, Bibliographies, List, Indexes of Publications of Parts

19. REPORT NUMBER 347.10.00.00-83-02

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OMB NO 22-R0336

GENERAL REPORT SUMMARY SHEET

Please Type All Information – See Instructions On Reverse

1 OF 1

1 ORIGINATOR'S REPORT TITLE	2 PROGRAM OR SYSTEM	3 DATE OF	DAY	MO	YR
Outgassing Data for Spacecraft Materials	Multiple	TEST COMPL.	01	12	74
	5 ORIGINATOR'S REPORT NO: NASA TN D-8008	REPT COMPL.	01	07	75

4 ORIGINATOR'S PART NAME/PART IDENTIFICATION: Spacecraft Materials

6 REPORT TYPE ETC: Materials Performance in Vacuum

7 THIS TEST (SUPERSEDES)(SUPPLEMENTS) REPORT NO

8 MANUFACTURER	9 MANUFACTURER PART NO	10 MFG-TYPE RATING SIZE, ETC
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11 OUTLINE TABLE OF CONTENTS SUMMARY OR EQUIVALENT DESCRIPTION

331.00.00.00-H6-CR
484.40.00.00-H6-CR
501.00.00.00-H6-CR

Outgassing data, derived from tests at 398 K (125°C) for 24 hours in vacuum, have been compiled for numerous materials for spacecraft use. The data presented are the total mass loss (TML) and the collected volatile condensable materials (CVCM). The various materials are compiled by likely usage and alphabetically.

12 ENVIRONMENTAL EXPOSURE CODES: Not Applicable

13 MANUFACTURER NOTIFIED (Day, Month Year): Not Applicable

14 KEY WORDS FOR GOE FILE: Total Mass Loss, Volatile Condensable Materials, Vacuum, Altitude, Temperature-High

15 SIGNATURE: [signature] 1/21/76

16 PARTICIPANT: NASA/Goddard Space Flight Center

17 ACCESS NUMBER: E054-1904

18 COMPONENT PART NAME PER GENERIC CODE: General Technical Data

19 REPORT NUMBER: 347.00.00.00-H6-01

DD FORM 1000

054-1904