

NASA SP-7063 (05)

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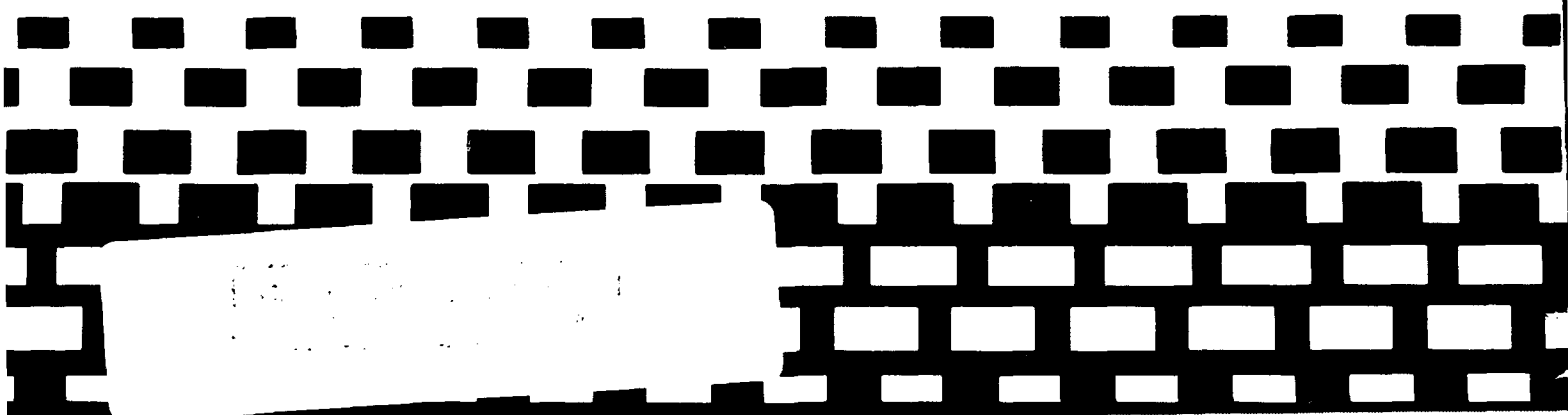
# NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS

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# NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS

A CATALOG OF SPECIAL PUBLICATIONS, REFERENCE  
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National Aeronautics and Space Administration  
Office of Management  
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Washington, DC 1991

91-5-15-001

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**ACCESSION NUMBER** → **N90-23837\***# National Aeronautics and Space Administration. ← **CORPORATE SOURCE**  
 Goddard Space Flight Center, Greenbelt, MD.

**TITLE** → **NIMBUS-7 TOMS ANTARCTIC OZONE ATLAS: AUGUST THROUGH NOVEMBER, 1989**

**AUTHORS** → ARLIN J. KRUEGER, LANNING M. PENN, DAVID E. LARKO, SCOTT D. DOIRON, and PATRICIA T. GUIMARAES (ST Systems Corp., Vienna, VA.) Jul. 1990 176 p

**REPORT NUMBERS** → (NASA-RP-1237; NAS 1.61:1237; REPT-90B00114) Avail: NTIS ← **PUBLICATION DATE**  
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**PRICE CODE** → Because of the great environmental significance of ozone and to support continuing research at the Antarctic and other Southern Hemisphere stations, the development of the 1989 ozone hole was monitored using data from the Nimbus-7 Total Ozone Mapping Spectrometer (TOMS) instrument, produced in near-real-time. This Atlas provides a complete set of daily polar orthographic projections of the TOMS total ozone measurements over the Southern Hemisphere for the period August 1 through November 30, 1989. The 1989 ozone hole developed in a manner similar to that of 1987, reaching a comparable depth in early October. This was in sharp contrast to the much weaker hole of 1988. The 1989 ozone hole remained at polar latitudes as it filled in November, in contrast to other recent years when the hole drifted to mid-latitudes before disappearing. Daily ozone values above selected Southern Hemisphere stations are presented, along with comparisons of the 1989 ozone distribution to that of other years. Author

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 Langley Research Center, Hampton, VA.

**TITLE** → **CAST-10-2/DOA 2 AIRFOIL STUDIES WORKSHOP RESULTS**

**AUTHORS** → EDWARD J. RAY, comp. and ACQUILLA S. HILL, comp. Washington Nov. 1989 259 p Workshop held in Hampton, VA, 23-27 Sep. 1988

**REPORT NUMBERS** → (NASA-CP-3052; L-16633; NAS 1.55:3052) Avail: NTIS HC ← **PUBLICATION DATE**  
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AERODYNAMIC CHARACTERISTICS, AERODYNAMIC INTERFERENCE, AIRFOIL PROFILES, AIRFOILS, CONFERENCES, FLOW DISTRIBUTION, REYNOLDS NUMBER, WIND TUNNEL TESTS

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Includes radar; land and global communications; communications theory; and optical communications. For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking*. For search and rescue see *03 Air Transportation and Safety*, and *16 Space Transportation*.

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**34 FLUID MECHANICS AND HEAT TRANSFER** ..... 35  
Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

**35 INSTRUMENTATION AND PHOTOGRAPHY** ..... 39  
Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

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<b>39 STRUCTURAL MECHANICS</b> .....	<b>42</b>
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Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see <i>93 Space Radiation</i> .	
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Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.	
<b>54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT</b> .....	<b>60</b>
Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also <i>16 Space Transportation</i> .	
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Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also <i>25 Inorganic and Physical Chemistry</i> and <i>34 Fluid Mechanics and Heat Transfer</i> .	
<b>SOCIAL SCIENCES</b>	
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**GENERAL**

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

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## AERONAUTICS (GENERAL)

- N87-18520\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**JOINT UNIVERSITY PROGRAM FOR AIR TRANSPORTATION RESEARCH, 1983**  
 FREDERICK R. MORRELL, comp. Mar. 1987 80 p Conference held in Atlantic City, N.J., 16 Dec. 1983; sponsored by NASA and FAA  
 (NASA-CP-2451; L-16254; NAS 1.55:2451) Avail: NTIS HC A05/MF A01 CSCL 01B  
 AIR NAVIGATION, AIR TRANSPORTATION, AIRCRAFT GUIDANCE, AVIONICS, CONFERENCES, FLIGHT CONTROL
- N87-22604\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**JOINT UNIVERSITY PROGRAM FOR AIR TRANSPORTATION RESEARCH, 1984**  
 FREDERICK R. MORRELL, comp. May 1987 165 p Meeting held in Hampton, Va., 18 Jan. 1985  
 (NASA-CP-2452; L-16255; NAS 1.55:2452) Avail: NTIS HC A08/MF A01 CSCL 01B  
 AIR TRANSPORTATION, AIRCRAFT CONTROL, AIRCRAFT GUIDANCE, AVIONICS, CONTROL THEORY, SURFACE NAVIGATION
- N87-25267\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**WIND SHEAR/TURBULENCE INPUTS TO FLIGHT SIMULATION AND SYSTEMS CERTIFICATION**  
 ROLAND L. BOWLES, ed. and WALTER FROST, ed. (FWG Associates, Inc., Tullahoma, Tenn.) Jul. 1987 272 p Workshop held in Hampton, Va., 30 May - 1 Jun. 1984  
 (NASA-CP-2474; L-16329; NAS 1.55:2474) Avail: NTIS HC A12/MF A02 CSCL 01B  
 AIRCRAFT PERFORMANCE, AVIONICS, FLIGHT SAFETY, FLIGHT SIMULATION, PILOT PERFORMANCE, WIND SHEAR
- N87-27596\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**JOINT UNIVERSITY PROGRAM FOR AIR TRANSPORTATION RESEARCH, 1985**  
 FREDERICK R. MORRELL, comp. Jul. 1987 100 p Conference held in Atlantic City, N.J., 30 Jan. 1986  
 (NAS 1.55:2453; NASA-CP-2453) Avail: NTIS HC A05/MF A01 CSCL 01B  
 AIR TRAFFIC CONTROL, AIR TRANSPORTATION, CONFERENCES, FAULT TOLERANCE, FLIGHT CONTROL, GLOBAL POSITIONING SYSTEM, INERTIAL NAVIGATION
- N87-27613\*** National Aeronautics and Space Administration, Washington, DC.  
**AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 217)**  
 Sep. 1987 134 p  
 (NASA-SP-7037(217); NAS 1.21:7037(217)) Avail: NTIS HC A07 CSCL 01B  
 This bibliography lists 450 reports, articles, and other documents introduced into the NASA scientific and technical information system in August, 1987. Author
- N88-14926\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**LANGLEY SYMPOSIUM ON AERODYNAMICS, VOLUME 1**  
 SHARON H. STACK, comp. Dec. 1986 592 p Symposium held in Hampton, Va., 23-25 Apr. 1985  
 (NASA-CP-2397; L-16031; NAS 1.55:2397) Avail: NTIS HC A25/MF A04 CSCL 01B  
 AERODYNAMIC CONFIGURATIONS, AIRCRAFT DESIGN, AIRCRAFT MANEUVERS, COMPUTATIONAL FLUID DYNAMICS, CONFERENCES
- N88-16625\*#** National Aeronautics and Space Administration, Washington, DC.  
**NASA/ARMY ROTORCRAFT TECHNOLOGY. VOLUME 1: AERODYNAMICS, AND DYNAMICS AND AEROELASTICITY**  
 Feb. 1988 537 p Conference held at Moffett Field, Calif., 17-19 Mar. 1987  
 (NASA-CP-2495-VOL-1; NAS 1.55:2495-VOL-1) Avail: NTIS HC A23/MF A03 CSCL 01B  
 AEROELASTICITY, COMPUTATIONAL FLUID DYNAMICS, CONFERENCES, FLIGHT CONTROL, HELICOPTERS, ROTOR AERODYNAMICS
- N88-16632\*#** National Aeronautics and Space Administration, Washington, DC.  
**NASA/ARMY ROTORCRAFT TECHNOLOGY. VOLUME 2: MATERIALS AND STRUCTURES, PROPULSION AND DRIVE SYSTEMS, FLIGHT DYNAMICS AND CONTROL, AND ACOUSTICS**  
 Feb. 1988 587 p Conference held at Moffett Field, Calif., 17-19 Mar. 1987  
 (NASA-CP-2495-VOL-2; NAS 1.55:2495-VOL-2) Avail: NTIS HC A25/MF A04 CSCL 01B  
 AEROACOUSTICS, AIRCRAFT DESIGN, CONFERENCES, CONTROLLABILITY, ENGINE DESIGN, FRACTURE MECHANICS, HELICOPTERS, ROTOR AERODYNAMICS
- N88-16650\*#** National Aeronautics and Space Administration, Washington, DC.  
**NASA/ARMY ROTORCRAFT TECHNOLOGY. VOLUME 3: SYSTEMS INTEGRATION, RESEARCH AIRCRAFT, AND INDUSTRY**  
 Feb. 1988 387 p Conference held at Moffett Field, Calif., 17-19 Mar. 1987  
 (NASA-CP-2495-VOL-3; NAS 1.55:2495-VOL-3) Avail: NTIS HC A17/MF A03 CSCL 01B  
 AIRCRAFT DESIGN, FLIGHT TESTS, HELICOPTER PERFORMANCE, ROTARY WING AIRCRAFT, SYSTEMS INTEGRATION

## 01 AERONAUTICS (GENERAL)

**N88-19407\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**GENERAL EQUILIBRIUM CHARACTERISTICS OF A DUAL-LIFT HELICOPTER SYSTEM**  
L. S. CICOLANI and G. KANNING Jul. 1986 86 p  
(NASA-TP-2615; A-86114; NAS 1.60:2615) Avail: NTIS HC A05/MF A01 CSCL 01B  
CARGO AIRCRAFT, EQUILIBRIUM, HEAVY LIFT HELICOPTERS, SUSPENDING (HANGING), TETHERING

**N88-23715\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**JOINT UNIVERSITY PROGRAM FOR AIR TRANSPORTATION RESEARCH, 1986**  
FRÉDERICK R. MORRELL, comp. Apr. 1988 115 p Meeting held in Hampton, Va., 8-9 Jan. 1987; sponsored by NASA, Langley Research Center, Hampton, Va. and FAA, Washington, D.C. Sponsored by NASA, Washington  
(NASA-CP-2502; L-16406; NAS 1.55:2502) Avail: NTIS HC A06/MF A01 CSCL 01B  
AERODYNAMICS, AIRCRAFT CONTROL, AIRCRAFT GUIDANCE, AVIONICS, SURFACE NAVIGATION

**N88-27148\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**INTEGRATED TECHNOLOGY ROTOR METHODOLOGY ASSESSMENT WORKSHOP**  
MICHAEL J. MCNULTY, ed. and WILLIAM G. BOUSMAN, ed. Jun. 1988 381 p Workshop held in Moffett Field, Calif., 21-22 Jun. 1983; sponsored by NASA, Ames Research Center and the Army Prepared in cooperation with Army Aviation Systems Command, Moffett Field, Calif. Sponsored by NASA, Washington, D.C.  
(NASA-CP-10007; A-86381; NAS 1.55:10007; USAAVSCOM-CP-88-A-001; AD-A200007) Avail: NTIS HC A17/MF A03 CSCL 01/2  
AERODYNAMIC STABILITY, AEROELASTICITY, CONFERENCES, MATHEMATICAL MODELS, ROTOR AERODYNAMICS, ROTOR BODY INTERACTIONS

**N88-27163\*** National Aeronautics and Space Administration, Washington, DC.  
**AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES**  
Aug. 1988 126 p  
(NASA-SP-7037(229); NAS 1.21:7037(229)) Avail: NTIS HC A07 CSCL 01B  
This bibliography lists 455 reports, articles, and other documents introduced into the NASA scientific and technical information system in July, 1988. Author

**N89-19230\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**JOINT UNIVERSITY PROGRAM FOR AIR TRANSPORTATION RESEARCH, 1987**  
FRÉDERICK R. MORRELL, comp. Apr. 1989 118 p Presented at a conference held in Atlantic City, NJ, 14-15 Jan. 1988  
(NASA-CP-3028; L-16547; NAS 1.55:3028) Avail: NTIS HC A06/MF A01 CSCL 01B  
AVIONICS, COMPUTER TECHNIQUES, CONTROL THEORY, GUIDANCE (MOTION), SURFACE NAVIGATION

**N89-22568\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EVALUATION OF THE RIDE QUALITY OF A LIGHT TWIN ENGINE AIRPLANE USING A RIDE QUALITY METER**  
ERIC C. STEWART Jun. 1989 27 p  
(NASA-TP-2913; L-16524; NAS 1.60:2913) Avail: NTIS HC A03/MF A01 CSCL 01B  
AIRCRAFT COMPARTMENTS, AIRCRAFT NOISE, NOISE TOLERANCE, SOUND TRANSMISSION, VIBRATION

**N89-29304\*** National Aeronautics and Space Administration, Washington, DC.  
**AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 242)**  
Aug. 1989 132 p  
(NASA-SP-7037(242); NAS 1.21:7037(242)) Avail: NTIS HC A07; NTIS standing order as PB89-914100, \$10.50 domestic, \$21.00 foreign CSCL 01A

This bibliography lists 466 reports, articles, and other documents introduced into the NASA scientific and technical information system in July, 1989. Subject coverage includes: design, construction and testing of aircraft and aircraft engines; aircraft components, equipment and systems; ground support systems; and theoretical and applied aspects of aerodynamics and general fluid dynamics. Author

**N90-20921\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**JOINT UNIVERSITY PROGRAM FOR AIR TRANSPORTATION RESEARCH, 1988-1989**  
FRÉDERICK R. MORRELL, comp. Mar. 1990 202 p Research program held during 1988-1989; sponsored by NASA, Langley Research Center and FAA  
(NASA-CP-3063; L-16740; NAS 1.55:3063) Avail: NTIS HC A10/MF A02 CSCL 01C  
AIR NAVIGATION, AIR TRAFFIC CONTROL, AIR TRANSPORTATION, AIRCRAFT CONTROL, AVIONICS, CONFERENCES, CONTROL SYSTEMS DESIGN, CONTROL THEORY, PSYCHOLOGY, UNIVERSITIES, WARNING SYSTEMS, WIND SHEAR

**N90-20942\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**LASER-VELOCIMETER-MEASURED FLOW FIELD AROUND AN ADVANCED, SWEPT, EIGHT-BLADE PROPELLER AT MACH 0.8**  
HARVEY E. NEUMAN, JOHN A. SERAFINI, DANIEL Y. WHIPPLE, and BRIAN T. HOWARD May 1985 100 p  
(NASA-TP-2462; E-2429; NAS 1.60:2462) Avail: Issuing Activity CSCL 01B  
FLOW DISTRIBUTION, LASER DOPPLER VELOCIMETERS, PROPELLERS, WIND TUNNEL TESTS

**N90-27648\*** National Aeronautics and Space Administration, Washington, DC.  
**AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 255)**  
Aug. 1990 153 p  
(NASA-SP-7037(255); NAS 1.21:7037(255)) Avail: NTIS HC A08; NTIS standing order as PB90-914100, \$11.50 domestic, \$23.00 foreign CSCL 01A

This bibliography lists 529 reports, articles, and other documents introduced into the NASA scientific and technical information system in June 1990. Subject coverage includes: design, construction and testing of aircraft and aircraft engines; aircraft components, equipment and systems; ground support systems; and theoretical and applied aspects of aerodynamics and general fluid dynamics. Author

## 02

### AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

**N77-85474\*** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.  
**SUPERCritical WING TECHNOLOGY: A REPORT ON**



**FLIGHT EVALUATIONS**

1972 133 p  
(NASA-SP-301; C72-71337)

**N87-10039\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**WIND-TUNNEL INVESTIGATION OF THE FLIGHT CHARACTERISTICS OF A CANARD GENERAL-AVIATION AIRPLANE CONFIGURATION**

D. R. SATRAN Oct. 1986 60 p  
(NASA-TP-2623; L-15929; NAS 1.60:2623) Avail: NTIS HC  
A04/MF A01 CSCL 01A

CANARD CONFIGURATIONS, FLIGHT CHARACTERISTICS, GENERAL AVIATION AIRCRAFT, WIND TUNNEL TESTS

**N87-10042\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**SUPERSONIC, NONLINEAR, ATTACHED-FLOW WING DESIGN FOR HIGH LIFT WITH EXPERIMENTAL VALIDATION**

J. L. PITTMAN, D. S. MILLER, and W. H. MASON (Grumman Aerospace Corp., Bethpage, N.Y.) Aug. 1984 221 p  
(NASA-TP-2336; L-15787; NAS 1.60:2336) Avail: NTIS HC  
A10/MF A02 CSCL 01A

CAMBERED WINGS, REATTACHED FLOW, SUPERCRITICAL FLOW, SUPERSONIC AIRFOILS, SUPERSONIC FLOW

**N87-10838\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**EFFECTS OF TAIL SPAN AND EMPENNAGE ARRANGEMENT ON DRAG OF A TYPICAL SINGLE-ENGINE FIGHTER AFT END**

J. R. BURLEY, II and B. L. BERRIER Sep. 1984 136 p  
(NASA-TP-2352; L-15742; NAS 1.60:2352) Avail: NTIS HC  
A07/MF A01 CSCL 01A

AERODYNAMIC DRAG, AIRCRAFT CONFIGURATIONS, SKIN FRICTION, TAIL ASSEMBLIES, TRANSONIC SPEED

**N87-10839\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**STATIC INTERNAL PERFORMANCE OF SINGLE-EXPANSION-RAMP NOZZLES WITH THRUST-VECTORING CAPABILITY UP TO 60 DEG**

B. L. BERRIER and L. D. LEAVITT Oct. 1984 144 p  
(NASA-TP-2364; L-15766; NAS 1.60:2364) Avail: NTIS HC  
A07/MF A01 CSCL 01A

AXISYMMETRIC BODIES, NOZZLE FLOW, THRUST VECTOR CONTROL

**N87-10841\*#** National Aeronautics and Space Administration.  
Ames Research Center, Moffett Field, CA.

**TRANSONIC FLOW ANALYSIS FOR ROTORS. PART 2: THREE-DIMENSIONAL, UNSTEADY, FULL-POTENTIAL CALCULATION**

I. C. CHANG Jan. 1985 27 p  
(NASA-TP-2375-PT-2; A-9682; NAS 1.60:2375-PT-2) Avail: NTIS HC  
A03/MF A01 CSCL 01A

AERODYNAMIC STABILITY, HELICOPTER PERFORMANCE, ROTORS, TIP VANES, TRANSONIC FLOW

**N87-10843\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**PILOTTED SIMULATION STUDY OF THE EFFECTS OF AN AUTOMATED TRIM SYSTEM ON FLIGHT CHARACTERISTICS OF A LIGHT TWIN-ENGINE AIRPLANE WITH ONE ENGINE INOPERATIVE**

E. C. STEWART, P. W. BROWN, and K. R. YENNI Nov. 1986 41 p  
(NASA-TP-2633; L-16147; NAS 1.60:2633) Avail: NTIS HC  
A03/MF A01 CSCL 01A

AERODYNAMIC BALANCE, AUTOMATIC FLIGHT CONTROL, ENGINE FAILURE, LIGHT AIRCRAFT

**N87-11702\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**FORWARD-SWEPT WING CONFIGURATION DESIGNED FOR HIGH MANEUVERABILITY BY USE OF A TRANSONIC COMPUTATIONAL METHOD**

M. J. MANN and C. E. MERCER Nov. 1986 185 p  
(NASA-TP-2628; L-16120; NAS 1.60:2628) Avail: NTIS HC  
A09/MF A01 CSCL 01A

AERODYNAMIC CONFIGURATIONS, HIGHLY MANEUVERABLE AIRCRAFT, SWEPT FORWARD WINGS, TRANSONIC SPEED

**N87-12541\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**EFFECT OF PORT CORNER GEOMETRY ON THE INTERNAL PERFORMANCE OF A ROTATING-VANE-TYPE THRUST REVERSER**

B. L. BERRIER and F. J. CAPONE Dec. 1986 51 p  
(NASA-TP-2624; L-16135; NAS 1.60:2624) Avail: NTIS HC  
A04/MF A01 CSCL 01A

CORNER FLOW, NOZZLE GEOMETRY, PORTS (OPENINGS), ROTATING BODIES, THRUST REVERSAL, VANES, WIND TUNNEL TESTS

**N87-14284\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**PROPAGATION OF SOUND WAVES IN TUBES OF NONCIRCULAR CROSS SECTION**

W. B. RICHARDS (Oberlin Coll., Ohio) Aug. 1986 33 p  
(NASA-TP-2601; E-2690; NAS 1.60:2601) Avail: NTIS HC  
A03/MF A01 CSCL 01A

ELLIPTICAL CYLINDERS, PIPES (TUBES), SOUND WAVES, WAVE PROPAGATION

**N87-15174\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**APPLICABILITY OF LINEARIZED-THEORY ATTACHED-FLOW METHODS TO DESIGN AND ANALYSIS OF FLAP SYSTEMS AT LOW SPEEDS FOR THIN SWEPT WINGS WITH SHARP LEADING EDGES**

HARRY W. CARLSON and CHRISTINE M. DARDEN Jan. 1987 54 p  
(NASA-TP-2653; L-16151; NAS 1.60:2653) Avail: NTIS HC  
A04/MF A01 CSCL 01A

DESIGN ANALYSIS, FLAPS (CONTROL SURFACES), LINEARITY, LOW SPEED, SHARP LEADING EDGES, SWEPT WINGS, THIN WINGS, VORTEX FLAPS

**N87-15183\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**EFFICIENT SOLUTIONS TO THE EULER EQUATIONS FOR SUPERSONIC FLOW WITH EMBEDDED SUBSONIC REGIONS**

ROBERT W. WALTERS and DOUGLAS L. DWOYER Jan. 1987 18 p  
(NASA-TP-2523; L-15975; NAS 1.60:2523) Avail: NTIS HC  
A03/MF A01 CSCL 01A

EMBEDDING, EULER EQUATIONS OF MOTION, PROBLEM SOLVING, SUBSONIC FLOW, SUPERSONIC FLOW

**N87-15184\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**SUBSONIC MANEUVER CAPABILITY OF A SUPERSONIC CRUISE FIGHTER WING CONCEPT**

GREGORY D. RIEBE and CHARLES H. FOX, JR. Jan. 1987 74 p  
(NASA-TP-2642; L-16097; NAS 1.60:2642) Avail: NTIS HC  
A04/MF A01 CSCL 01A

FIGHTER AIRCRAFT, MANEUVERS, SUBSONIC SPEED, SUPERSONIC CRUISE AIRCRAFT RESEARCH, WINGS

**N87-17665\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**PRELIMINARY DESIGN OF TURBOPUMPS AND RELATED MACHINERY**

## 02 AERODYNAMICS

GEORGE F. WISLICENUS Oct. 1986 397 p  
(NAS3-13475)  
(NASA-RP-1170; E-7389; NAS 1.61:1170) Avail: NTIS HC  
A17/MF A03 CSCL 01A

Pumps used in large liquid-fuel rocket engines are examined. The term preliminary design denotes the initial, creative phases of design, where the general shape and characteristics of the machine are determined. This compendium is intended to provide the design engineer responsible for these initial phases with a physical understanding and background knowledge of the numerous special fields involved in the design process. Primary attention is directed to the pumping part of the turbopump and hence is concerned with essentially incompressible fluids. However, compressible flow principles are developed. As much as possible, the simplicity and reliability of incompressible flow considerations are retained by treating the mechanics of compressible fluids as a departure from the theory of incompressible fluids. Five areas are discussed: a survey of the field of turbomachinery in dimensionless form; the theoretical principles of the hydrodynamic design of turbomachinery; the hydrodynamic and gas dynamic design of axial flow turbomachinery; the hydrodynamic and gas dynamic design of radial and mixed flow turbomachinery; and some mechanical design considerations of turbomachinery. Theoretical considerations are presented with a relatively elementary mathematical treatment. Author

**N87-17668\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**WIND-TUNNEL INVESTIGATION AT SUPERSONIC SPEEDS OF A REMOTE-CONTROLLED CANARD MISSILE WITH A FREE-ROLLING-TAIL BRAKE TORQUE SYSTEM**

A. B. BLAIR, JR. Mar. 1985 38 p  
(NASA-TP-2401; L-15882; NAS 1.60:2401) Avail: NTIS HC  
A03/MF A01 CSCL 01A

BRAKING, CANARD CONFIGURATIONS, FINS, MISSILE CONFIGURATIONS, REMOTE CONTROL, ROLLING MOMENTS, SUPERSONIC SPEED, TAIL ASSEMBLIES, TORQUE, WIND TUNNEL TESTS

**N87-17669\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**COMBINED AERODYNAMIC AND STRUCTURAL DYNAMIC PROBLEM EMULATING ROUTINES (CASPER): THEORY AND IMPLEMENTATION**

WILLIAM H. JONES Feb. 1985 75 p  
(NASA-TP-2418; E-2278; NAS 1.60:2418) Avail: NTIS HC  
A04/MF A01 CSCL 01A

AERODYNAMIC COEFFICIENTS, COMPUTATIONAL FLUID DYNAMICS, COMPUTERIZED SIMULATION, DYNAMIC STRUCTURAL ANALYSIS

**N87-18537\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**HELICOPTER BLADE-VORTEX INTERACTION LOCATIONS: SCALE-MODEL ACOUSTICS AND FREE-WAKE ANALYSIS RESULTS**

DANNY R. HOAD Apr. 1987 106 p  
(DA PROJ. 1L1-62209-AH-76-A)  
(NASA-TP-2658; L-16214; AVSCOM-TM-87-B-1; NAS 1.60:2658; AD-A179379) Avail: NTIS HC A06/MF A01 CSCL 01/1

ACOUSTICS, BLADE-VORTEX INTERACTION, FREE FLOW, HELICOPTERS, ROTORS, VORTICES, WAKES

**N87-19351\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**NUMERICAL SIMULATION OF CHANNEL FLOW TRANSITION, RESOLUTION REQUIREMENTS AND STRUCTURE OF THE HAIRPIN VORTEX**

STEVEN E. KRIST (Joint Inst. for Advancement of Flight Sciences, Hampton, Va.) and THOMAS A. ZANG Apr. 1987 71 p  
(NASA-TP-2667; L-16204; NAS 1.60:2667) Avail: NTIS HC  
A04/MF A01 CSCL 01A

BOUNDARY LAYER STABILITY, BOUNDARY LAYER TRANSITION, BOUNDARY VALUE PROBLEMS, CHANNEL FLOW, COMPUTATIONAL FLUID DYNAMICS, SPECTRAL METHODS

**N87-20233\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**INVESTIGATION OF LEADING-EDGE FLAP PERFORMANCE ON DELTA AND DOUBLE-DELTA WINGS AT SUPERSONIC SPEEDS**

PETER F. COVELL, RICHARD M. WOOD, and DAVID S. MILLER Apr. 1987 125 p  
(NASA-TP-2656; L-16143; NAS 1.60:2656) Avail: NTIS HC  
A06/MF A01 CSCL 01A

DELTA WINGS, EXPERIMENT DESIGN, LEADING EDGE FLAPS, SUPERSONIC SPEED

**N87-20238\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**LEWIS INVERSE DESIGN CODE (LINDEX): USERS MANUAL**

JOSE M. SANZ Mar. 1987 67 p  
(NASA-TP-2676; E-3221; NAS 1.60:2676) Avail: NTIS HC  
A04/MF A01 CSCL 01A

AIRFOILS, CODING, DESIGN ANALYSIS, HODOGRAPHS, INVERSIONS, TURBINE BLADES, USER MANUALS (COMPUTER PROGRAMS)

**N87-20966\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.

**IN-FLIGHT SURFACE OIL-FLOW PHOTOGRAPHS WITH COMPARISONS TO PRESSURE DISTRIBUTION AND BOUNDARY-LAYER DATA**

ROBERT R. MEYER, JR. and LISA A. JENNETT Apr. 1985 27 p Original contains color illustrations  
(NASA-TP-2395; H-1184; NAS 1.60:2395) Avail: NTIS HC  
A03/MF A01 CSCL 01A

BOUNDARY LAYER FLOW, FLOW VISUALIZATION, IN-FLIGHT MONITORING, OILS, PHOTOGRAPHY, PRESSURE DISTRIBUTION

**N87-21855\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**WIND-TUNNEL FREE-FLIGHT INVESTIGATION OF A 0.15-SCALE MODEL OF THE F-106B AIRPLANE WITH VORTEX FLAPS**

LONG P. YIP May 1987 46 p  
(NASA-TP-2700; L-16202; NAS 1.60:2700) Avail: NTIS HC  
A03/MF A01 CSCL 01A

F-106 AIRCRAFT, FREE FLIGHT, VORTEX FLAPS, WIND TUNNEL MODELS, WIND TUNNEL TESTS

**N87-21871\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**NEW METHODS AND RESULTS FOR QUANTIFICATION OF LIGHTNING-AIRCRAFT ELECTRODYNAMICS**

FELIX L. PITTS, LARRY D. LEE, RODNEY A. PERALA, and TERENCE H. RUDOLPH (Electro Magnetic Applications, Inc., Lakewood, Colo.) Jun. 1987 67 p  
(NASA-TP-2737; L-16281; NAS 1.60:2737) Avail: NTIS HC  
A04/MF A01 CSCL 01A

ELECTRODYNAMICS, F-106 AIRCRAFT, FLIGHT TESTS, LIGHTNING, RESEARCH AIRCRAFT

**N87-21873\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EFFECTS OF AFTERBODY BOATTAIL DESIGN AND EMPENNAGE ARRANGEMENT ON AEROPROPULSIVE CHARACTERISTICS OF A TWIN-ENGINE FIGHTER MODEL AT TRANSONIC SPEEDS**

LINDA S. BANGERT, LAURENCE D. LEAVITT, and DAVID E. REUBUSH Jun. 1987 134 p  
(NASA-TP-2704; L-16227; NAS 1.60:2704) Avail: NTIS HC  
A07/MF A01 CSCL 01A

AFTERBODIES, AXISYMMETRIC FLOW, BOATTAILS, DRAG,

FIGHTER AIRCRAFT, NOZZLES, PROPULSIVE EFFICIENCY, TAIL ASSEMBLIES

**N87-22626\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EXPERIMENTAL CAVITY PRESSURE DISTRIBUTIONS AT SUPERSONIC SPEEDS**

ROBERT L. STALLINGS, JR. and FLOYD J. WILCOX, JR. Jun. 1987 79 p

(NASA-TP-2683; L-16215; NAS 1.60:2683) Avail: NTIS HC A05/MF A01 CSCL 01A

CAVITIES, FLUID FLOW, PRESSURE DISTRIBUTION, SUPERSONIC SPEED

**N87-23586\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ON MINIMIZING THE NUMBER OF CALCULATIONS IN DESIGN-BY-ANALYSIS CODES**

RAYMOND L. BARGER and ANUTOSH MOITRA Jun. 1987 16 p

(NASA-TP-2706; L-16226; NAS 1.60:2706) Avail: NTIS HC A03/MF A01 CSCL 01A

AERODYNAMIC CONFIGURATIONS, APPROXIMATION, DESIGN ANALYSIS, NUMERICAL ANALYSIS, PRESSURE DISTRIBUTION

**N87-23592\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**MACH 6 EXPERIMENTAL AND THEORETICAL STABILITY AND PERFORMANCE OF A CRUCIFORM MISSILE AT ANGLES OF ATTACK UP TO 65 DEGREES**

EDWARD R. HARTMAN (Arnold Engineering Development Center, Arnold Air Force Station, Tenn.) and PATRICK J. JOHNSTON Jul. 1987 41 p

(NASA-TP-2733; L-16287; NAS 1.60:2733) Avail: NTIS HC A03/MF A01 CSCL 01A

ANGLE OF ATTACK, CRUCIFORM WINGS, EXPERIMENTATION, HYPERSONIC SPEED, MACH NUMBER, MISSILES

**N87-23593\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EFFECT OF A TRADE BETWEEN BOATTAIL ANGLE AND WEDGE SIZE ON THE PERFORMANCE OF A NONAXISYMMETRIC WEDGE NOZZLE**

GEORGE T. CARSON, JR., E. ANN BARE, and JAMES R. BURLEY, II Jul. 1987 67 p

(NASA-TP-2717; L-16248; NAS 1.60:2717) Avail: NTIS HC A04/MF A01 CSCL 01A

AXISYMMETRIC BODIES, BOATTAILS, NOZZLE GEOMETRY, PERFORMANCE TESTS, TRADEOFFS, WEDGES

**N87-23597\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**STUDY OF LEE-SIDE FLOWS OVER CONICALLY CAMBERED DELTA WINGS AT SUPERSONIC SPEEDS, PART 1**

RICHARD M. WOOD and CAROLYN B. WATSON Jul. 1987 212 p

(NASA-TP-2660-PT-1; L-16192; NAS 1.60:2660-PT-1) Avail: NTIS HC A10/MF A02 CSCL 01A

CONICAL CAMBER, DELTA WINGS, FLOW DISTRIBUTION, LEE WAVES, STRUCTURAL DESIGN, SUPERSONIC FLOW, VORTICES

**N87-24410\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**PROCEEDINGS OF THE 1985 NASA AMES RESEARCH CENTER'S GROUND-EFFECTS WORKSHOP**

KERRY MITCHELL, ed. Feb. 1987 448 p Workshop held at Moffett Field, Calif., 20-21 Aug. 1985

(NASA-CP-2462; A-86391; NAS 1.55:2462) Avail: NTIS HC A19/MF A03 CSCL 01A

GROUND EFFECT (AERODYNAMICS), INGESTION

(ENGINES), POWERED LIFT AIRCRAFT, V/STOL AIRCRAFT, VERTICAL LANDING

**N87-24432\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**STATIC INTERNAL PERFORMANCE OF A TWO-DIMENSIONAL CONVERGENT-DIVERGENT NOZZLE WITH THRUST VECTORING**

E. ANN BARE and DAVID E. REUBUSH Jul. 1987 115 p (NASA-TP-2721; L-16240; NAS 1.60:2721) Avail: NTIS HC A06/MF A01 CSCL 01A

CONVERGENT-DIVERGENT NOZZLES, STATIC TESTS, THRUST VECTOR CONTROL, TWO DIMENSIONAL FLOW

**N87-24433\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**MULTIAXIS CONTROL POWER FROM THRUST VECTORING FOR A SUPERSONIC FIGHTER AIRCRAFT MODEL AT MACH 0.20 TO 2.47**

FRANCIS J. CAPONE and E. ANN BARE Jul. 1987 264 p (NASA-TP-2712; L-16213; NAS 1.60:2712) Avail: NTIS HC A12/MF A02 CSCL 01A

FIGHTER AIRCRAFT, MACH NUMBER, SUPERSONIC CRUISE AIRCRAFT RESEARCH, THRUST VECTOR CONTROL

**N87-25301\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**STUDY OF LEE-SIDE FLOWS OVER CONICALLY CAMBERED DELTA WINGS AT SUPERSONIC SPEEDS, PART 2**

RICHARD M. WOOD and CAROLYN B. WATSON Jul. 1987 404 p

(NASA-TP-2660-PT-2; L-16192; NAS 1.60:2660-PT-2) Avail: NTIS HC A18/MF A03 CSCL 01A

CONICAL CAMBER, DELTA WINGS, FLOW DISTRIBUTION, FLOW VISUALIZATION, SUPERSONIC FLOW, WING LOADING

**N87-25998\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**SUPERCOMPUTING IN AEROSPACE**

PAUL KUTLER and HELEN YEE Mar. 1987 299 p Symposium held at Moffett Field, Calif., 10-12 Mar. 1987

(NASA-CP-2454; A-87082; NAS 1.55:2454) Avail: NTIS HC A13/MF A02 CSCL 01A

COMPUTATIONAL ASTROPHYSICS, COMPUTATIONAL CHEMISTRY, COMPUTATIONAL FLUID DYNAMICS, COMPUTATIONAL GRIDS, COMPUTERIZED SIMULATION, CONFERENCES, INTERACTIONAL AERODYNAMICS, NAVIER-STOKES EQUATION, SUPERCOMPUTERS

**N87-26031\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EFFECT OF REYNOLDS NUMBER VARIATION ON AERODYNAMICS OF A HYDROGEN-FUELED TRANSPORT CONCEPT AT MACH 6**

JIM A. PENLAND and DON C. MARCUM, JR. Aug. 1987 28 p (NASA-TP-2728; L-16286; NAS 1.60:2728) Avail: NTIS HC A03/MF A01 CSCL 01A

AERODYNAMIC CONFIGURATIONS, HYDROGEN FUELS, HYPERSONIC AIRCRAFT, MACH NUMBER, REYNOLDS NUMBER, TRANSPORT AIRCRAFT

**N87-26032\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**STEADY AND UNSTEADY AERODYNAMIC FORCES FROM THE SOUSSA SURFACE-PANEL METHOD FOR A FIGHTER WING WITH TIP MISSILE AND COMPARISON WITH EXPERIMENT AND PANAIR**

HERBERT J. CUNNINGHAM Aug. 1987 29 p

(NASA-TP-2736; L-16262; NAS 1.60:2736) Avail: NTIS HC A03/MF A01 CSCL 01A

AERODYNAMIC FORCES, FIGHTER AIRCRAFT, PANEL METHOD (FLUID DYNAMICS), UNSTEADY AERODYNAMICS, UNSTEADY FLOW, WINGS

## 02 AERODYNAMICS

**N87-26874\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**SUBSONIC LONGITUDINAL AND LATERAL-DIRECTIONAL CHARACTERISTICS OF A FORWARD-SWEPT-WING FIGHTER CONFIGURATION AT ANGLES OF ATTACK UP TO 47 DEG**  
MICHAEL J. MANN, JARRETT K. HUFFMAN, and CHARLES H. FOX, JR. Sep. 1987 103 p  
(NASA-TP-2727; L-16206; NAS 1.60:2727) Avail: NTIS HC A06/MF A01 CSCL 01A  
AERODYNAMIC CONFIGURATIONS, ANGLE OF ATTACK, FIGHTER AIRCRAFT, LATERAL CONTROL, LATERAL STABILITY, SUBSONIC AIRCRAFT, SWEPT FORWARD WINGS

**N87-26883\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**AN EXPERIMENTAL INVESTIGATION OF AN ADVANCED TURBOPROP INSTALLATION ON A SWEPT WING AT SUBSONIC AND TRANSONIC SPEEDS**  
JOHN R. CARLSON and ODIS C. PENDERGRAFT, JR. Sep. 1987 242 p  
(NASA-TP-2729; L-16043; NAS 1.60:2729) Avail: NTIS HC A11/MF A02 CSCL 01A  
AERODYNAMICS, ENGINE AIRFRAME INTEGRATION, SUBSONIC SPEED, SWEPT WINGS, TRANSONIC SPEED, TURBOPROP ENGINES

**N87-27622\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**CALCULATION OF VISCOUS EFFECTS ON TRANSONIC FLOW FOR OSCILLATING AIRFOILS AND COMPARISONS WITH EXPERIMENT**  
JAMES T. HOWLETT and SAMUEL R. BLAND Sep. 1987 77 p  
(NASA-TP-2731; L-16289; NAS 1.60:2731) Avail: NTIS HC A05/MF A01 CSCL 01A  
AIRFOILS, COMPARISON, INVISCID FLOW, OSCILLATIONS, TRANSONIC FLOW, VISCOUS FLOW

**N87-27626\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**DRAG MEASUREMENTS OF BLUNT STORES TANGENTIALLY MOUNTED ON A FLAT PLATE AT SUPERSONIC SPEEDS**  
FLOYD J. WILCOX, JR. Sep. 1987 68 p  
(NASA-TP-2742; L-16284; NAS 1.60:2742) Avail: NTIS HC A04/MF A01 CSCL 01A  
AERODYNAMIC DRAG, BLUNT BODIES, EXTERNAL STORES, FLAT PLATES, MOUNTING, SUPERSONIC SPEED, TANGENTS

**N87-27643\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**PRESSURE MEASUREMENTS ON A THICK CAMBERED AND TWISTED 58 DEG DELTA WING AT HIGH SUBSONIC SPEEDS**  
JULIO CHU and JOHN E. LAMAR Sep. 1987 233 p  
(NASA-TP-2713; L-16224; NAS 1.60:2713) Avail: NTIS HC A11/MF A02 CSCL 01A  
CAMBER, DELTA WINGS, PRESSURE MEASUREMENT, SUBSONIC SPEED, THICKNESS, TWISTED WINGS

**N87-29432\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**AUTOMATED REDUCTION OF DATA FROM IMAGES AND HOLOGRAMS**  
G. LEE, ed., JAMES D. TROLINGER, ed. (Spectron Development Labs., Inc., Costa Mesa, Calif.), and Y. H. YU, ed. May 1987 614 p Workshop held at Moffett Field, Calif., 10-11 Jan. 1985  
(NASA-CP-2477; A-87135; NAS 1.55:2477) Avail: NTIS HC A99/MF A04 CSCL 01A  
COMBUSTIBLE FLOW, DIGITAL TECHNIQUES, HOLOGRAPHIC INTERFEROMETRY, IMAGE ANALYSIS, PARTICLE SIZE DISTRIBUTION

**N87-29462\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**LOW-SPEED AERODYNAMIC CHARACTERISTICS OF A TWIN-ENGINE GENERAL AVIATION CONFIGURATION WITH AFT-FUSELAGE-MOUNTED PUSHER PROPELLERS**  
DANA MORRIS DUNHAM, GARL L. GENTRY, JR., GREGORY S. MANUEL, ZACHARY T. APPLIN, and P. FRANK QUINTO Oct. 1987 116 p  
(NASA-TP-2763; L-16331; NAS 1.60:2763) Avail: NTIS HC A06/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, GENERAL AVIATION AIRCRAFT, LOW SPEED, PROPELLERS, PROPULSION SYSTEM CONFIGURATIONS, PYLON MOUNTING, TURBOPROP ENGINES

**N88-10009\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**WIND-TUNNEL INVESTIGATION OF A FULL-SCALE GENERAL AVIATION AIRPLANE EQUIPPED WITH AN ADVANCED NATURAL LAMINAR FLOW WING**  
DANIEL G. MURRI and FRANK L. JORDAN, JR. Nov. 1987 136 p  
(NASA-TP-2772; L-16283; NAS 1.60:2772) Avail: NTIS HC A07/MF A01 CSCL 01A  
GENERAL AVIATION AIRCRAFT, LAMINAR FLOW AIRFOILS, WIND TUNNEL TESTS, WINGS

**N88-10765\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**COMPARISON OF WIND TUNNEL AND FLIGHT TEST AFTERBODY AND NOZZLE PRESSURES FOR A TWIN-JET FIGHTER AIRCRAFT AT TRANSONIC SPEEDS**  
JACK NUGENT and ODIS C. PENDERGRAFT, JR. Mar. 1987 125 p  
(NASA-TP-2588; H-1214; NAS 1.60:2588) Avail: NTIS HC A06/MF A01 CSCL 01A  
AFTERBODIES, FIGHTER AIRCRAFT, FLIGHT TESTS, NOZZLE THRUST COEFFICIENTS, TRANSONIC SPEED, WIND TUNNEL MODELS, WIND TUNNEL TESTS

**N88-10771\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EFFECT OF EMPENNAGE ARRANGEMENT ON SINGLE-ENGINE NOZZLE/AFTERBODY STATIC PRESSURES AT TRANSONIC SPEEDS**  
WILLIAM P. HENDERSON and JAMES R. BURLEY, II Nov. 1987 230 p  
(NASA-TP-2753; L-16223; NAS 1.60:2753) Avail: NTIS HC A11/MF A02 CSCL 01A  
AFTERBODIES, AXISYMMETRIC FLOW, JET AIRCRAFT, JET ENGINES, NOZZLES, STATIC PRESSURE, TAIL ASSEMBLIES, TRANSONIC SPEED

**N88-12454\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**PLANFORM EFFECTS ON THE SUPERSONIC AERODYNAMICS OF MULTIBODY CONFIGURATIONS**  
NAOMI MCMILLIN and RICHARD M. WOOD 1987 138 p  
(NASA-TP-2762; L-16312; NAS 1.60:2762) Avail: NTIS HC A07/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, AERODYNAMIC DRAG, AIRCRAFT CONFIGURATIONS, FINENESS RATIO, PLANFORMS, SUPERSONICS, ZERO LIFT

**N88-12455\*** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EFFECTS OF THE INSTALLATION AND OPERATION OF JET-EXHAUST YAW VANES ON THE LONGITUDINAL AND LATERAL-DIRECTIONAL CHARACTERISTICS OF THE F-14 AIRPLANE**  
DAVID E. REUBUSH and BOBBY L. BERRIER Dec. 1987 121 p

(NASA-TP-2769; L-16302; NAS 1.60:2769) Avail: NTIS HC  
A06/MF A01 CSCL 01A

**AERODYNAMIC STABILITY, AIRCRAFT CONTROL, DIRECTIONAL STABILITY, F-14 AIRCRAFT, JET VANES, LATERAL STABILITY, LONGITUDINAL STABILITY, THRUST VECTOR CONTROL, WIND TUNNEL STABILITY TESTS**

**N88-16662\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A SIMPLIFIED APPROACH TO AXISYMMETRIC DUAL-REFLECTOR ANTENNA DESIGN**

RAYMOND L. BARGER Mar. 1988 14 p  
(NASA-TP-2797; L-16392; NAS 1.60:2797) Avail: NTIS HC  
A03/MF A01 CSCL 20N

**ANTENNA DESIGN, ANTENNA RADIATION PATTERNS, REFLECTOR ANTENNAS, REFLECTORS, STIMULATED EMISSION**

**N88-17586\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**PROCEEDINGS OF THE CIRCULATION-CONTROL WORKSHOP, 1986**

JACK N. NIELSEN, comp. May 1987 591 p Workshop held at Moffett Field, Calif., 19-21 Feb. 1986 Original contains color illustrations

(NASA-CP-2432; A-86314; NAS 1.55:2432) Avail: NTIS HC  
A25/MF A04 CSCL 01A

**AIRCRAFT CONTROL, CIRCULATION CONTROL AIRFOILS, CIRCULATION CONTROL ROTORS, COANDA EFFECT, X WING ROTORS**

**N88-17614\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A TRANSONIC-SMALL-DISTURBANCE WING DESIGN METHODOLOGY**

PAMELA S. PHILLIPS, EDGAR G. WAGGONER, and RICHARD L. CAMPBELL Mar. 1988 32 p  
(NASA-TP-2806; L-16393; NAS 1.60:2806) Avail: NTIS HC  
A03/MF A01 CSCL 01A

**CODING, COMPUTER PROGRAMS, DESIGN ANALYSIS, SMALL PERTURBATION FLOW, TRANSONIC FLOW, WINGS**

**N88-17615\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**SUPERSONIC AERODYNAMICS OF DELTA WINGS**

RICHARD M. WOOD Mar. 1988 106 p  
(NASA-TP-2771; L-16212; NAS 1.60:2771) Avail: NTIS HC  
A06/MF A01 CSCL 01A

**AERODYNAMICS, DELTA WINGS, INVISCID FLOW, SUPERSONIC AIRFOILS, SUPERSONIC SPEED**

**N88-18552\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A PERFORMANCE INDEX APPROACH TO AERODYNAMIC DESIGN WITH THE USE OF ANALYSIS CODES ONLY**

RAYMOND L. BARGER and ANUTOSH MOITRA (High Technology Corp., Hampton, Va.) Mar. 1988 21 p  
(NASA-TP-2805; L-16379; NAS 1.60:2805) Avail: NTIS HC  
A03/MF A01 CSCL 01A

**AERODYNAMIC CONFIGURATIONS, CODING, COMPUTER PROGRAMS, DESIGN ANALYSIS, INDEXES (DOCUMENTATION), PERFORMANCE TESTS**

**N88-18567\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.

**EFFECTS OF WINGLETS ON A FIRST-GENERATION JET TRANSPORT WING. 7: SIDESLIP EFFECTS ON WINGLET LOADS AND SELECTED WING LOADS AT SUBSONIC SPEEDS FOR A FULL-SPAN MODEL**

ROBERT R. MEYER, JR. and PETER F. COVELL Sep. 1986 60 p

(NASA-TP-2619; H-1193; NAS 1.60:2619) Avail: NTIS HC  
A04/MF A01 CSCL 01A

**SIDESLIP, SUBSONIC SPEED, WIND TUNNEL MODELS, WINGLETS**

**N88-19412\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**TRAJECTORY CHARACTERISTICS AND HEATING OF HYPERVELOCITY PROJECTILES HAVING LARGE BALLISTIC COEFFICIENTS**

MICHAEL E. TAUBER Aug. 1986 21 p  
(NASA-TP-2614; A-86187; NAS 1.60:2614) Avail: NTIS HC  
A03/MF A01 CSCL 01A

**AERODYNAMIC HEATING, BALLISTIC TRAJECTORIES, HYPERVELOCITY PROJECTILES, TRAJECTORY ANALYSIS**

**N88-19416\*#** National Aeronautics and Space Administration. Washington, DC.

**AERONAUTICAL ENGINEERING: A CUMULATIVE INDEX TO A CONTINUING BIBLIOGRAPHY**

Jan. 1988 499 p  
(NASA-SP-7037(222); NAS 1.21:7037(222)) Avail: NTIS HC  
\$14.50 domestic, \$29.00 foreign CSCL 01A

This bibliography is a cumulative index to the abstracts contained in NASA SP-7037(210) through NASA SP-7037(221) of Aeronautical Engineering: A Continuing Bibliography. NASA SP-7037 and its supplements have been compiled through the cooperative efforts of the American Institute of Aeronautics and Astronautics (AIAA) and the National Aeronautics and Space Administration (NASA). This cumulative index includes subject, personal author, corporate source, foreign technology, contract number, report number, and accession number indexes. Author

**N88-19420\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**AERODYNAMIC CHARACTERISTICS OF WINGS DESIGNED WITH A COMBINED-THEORY METHOD TO CRUISE AT A MACH NUMBER OF 4.5**

ROBERT J. MACK Apr. 1988 60 p Sponsored by NASA, Washington  
(NASA-TP-2799; L-16333; NAS 1.60:2799) Avail: NTIS HC  
A04/MF A01 CSCL 01A

**AERODYNAMIC CHARACTERISTICS, AIRCRAFT DESIGN, CAMBERED WINGS, DESIGN ANALYSIS, HYPERSONIC SPEED, SUPERSONIC SPEED**

**N88-20257\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**AN EXPERIMENTAL INVESTIGATION OF THE FLAP-LAG-TORSION AEROELASTIC STABILITY OF A SMALL-SCALE HINGELESS HELICOPTER ROTOR IN HOVER**

DAVID L. SHARPE Jan. 1986 86 p Prepared in cooperation with Army Aviation Research and Development Command, Moffett Field, Calif.

(NASA-TP-2546; REPT-85142; NAS 1.60:2546; AVSCOM-TR-85-A-9) Avail: NTIS HC A05/MF A01 CSCL 01A  
**AEROELASTICITY, FLAPS (CONTROL SURFACES), HELICOPTERS, HOVERING, RIGID ROTORS, STABILITY, TORSION**

**N88-20264\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A REVIEW OF TECHNOLOGIES APPLICABLE TO LOW-SPEED FLIGHT OF HIGH-PERFORMANCE AIRCRAFT INVESTIGATED IN THE LANGLEY 14- X 22-FOOT SUBSONIC TUNNEL**

JOHN W. PAULSON, JR., P. FRANK QUINTO, DANIEL W. BANKS, GUY T. KEMMERLY, and GREGORY M. GATLIN May 1988 94 p

(NASA-TP-2796; L-16364; NAS 1.60:2796) Avail: NTIS HC  
A05/MF A01 CSCL 01A

**AERODYNAMIC CONFIGURATIONS, FLIGHT TESTS, LOW SPEED, RESEARCH FACILITIES, SHORT TAKEOFF AIRCRAFT, TECHNOLOGY ASSESSMENT, V/STOL AIRCRAFT, WIND TUNNEL TESTS**

## 02 AERODYNAMICS

**N88-20280\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **STATIC PERFORMANCE OF AN AXISYMMETRIC NOZZLE WITH POST-EXIT VANES FOR MULTIAxis THRUST VECTORING**

BOBBY L. BERRIER and MARY L. MASON May 1988 54 p  
(NASA-TP-2800; L-16371; NAS 1.60:2800) Avail: NTIS HC  
A04/MF A01 CSCL 01A

AXISYMMETRIC BODIES, CONVERGENT-DIVERGENT NOZZLES, STATIC TESTS, THRUST VECTOR CONTROL, VANES

**N88-21117\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **THE NASA LANGLEY LAMINAR-FLOW-CONTROL (LFC) EXPERIMENT ON A SWEPT, SUPERCRITICAL AIRFOIL: DESIGN OVERVIEW**

CHARLES D. HARRIS, WILLIAM D. HARVEY, and CUYLER W. BROOKS, JR. May 1988 128 p  
(NASA-TP-2809; L-16324; NAS 1.60:2809) Avail: NTIS HC  
A07/MF A01 CSCL 01A

BOUNDARY LAYER CONTROL, LAMINAR BOUNDARY LAYER, LAMINAR FLOW, SUPERCRITICAL AIRFOILS, SWEPT WINGS

**N88-21118\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **STATIC PERFORMANCE OF NONAXISYMMETRIC NOZZLES WITH YAW THRUST-VECTORING VANES**

MARY L. MASON and BOBBY L. BERRIER May 1988 79 p  
(NASA-TP-2813; L-16389; NAS 1.60:2813) Avail: NTIS HC  
A05/MF A01 CSCL 01A

CONVERGENT NOZZLES, CONVERGENT-DIVERGENT NOZZLES, STATIC TESTS, STATIC THRUST, THRUST VECTOR CONTROL

**N88-23735\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **NUMERICAL SIMULATION OF SCRAMJET INLET FLOW FIELDS**

AJAY KUMAR May 1986 29 p  
(NASA-TP-2517; L-16000; NAS 1.60:2517) Avail: NTIS HC  
A03/MF A01 CSCL 01A

APPLICATIONS PROGRAMS (COMPUTERS), COMPUTATIONAL FLUID DYNAMICS, INLET FLOW, NAVIER-STOKES EQUATION, SUPERSONIC COMBUSTION RAMJET ENGINES, THREE DIMENSIONAL FLOW, TURBULENT FLOW

**N88-23737\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **LAMINAR FLOW AIRCRAFT CERTIFICATION**

LOUIS J. WILLIAMS, comp. May 1986 325 p Workshop held in Wichita, Kans., 15-16 Apr. 1985; sponsored by NASA, AIAA, SAE and FAA Sponsored by NASA, Washington  
(NASA-CP-2413; L-16111; NAS 1.55:2413) Avail: NTIS HC  
A14/MF A02 CSCL 01A

AIRCRAFT DESIGN, CERTIFICATION, CONFERENCES, LAMINAR FLOW, LAMINAR FLOW AIRFOILS

**N88-23757\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **AEROPROPULSIVE CHARACTERISTICS OF ISOLATED COMBINED TURBOJET/RAMJET NOZZLES AT MACH NUMBERS FROM 0 TO 1.20**

GEORGE T. CARSON, JR. and MILTON LAMB Jun. 1988 174 p  
(NASA-TP-2814; L-16390; NAS 1.60:2814) Avail: NTIS HC  
A08/MF A01 CSCL 01A

MACH NUMBER, NOZZLE EFFICIENCY, NOZZLE GEOMETRY, RAMJET ENGINES, ROCKET NOZZLES, TURBINE ENGINES

**N88-23760\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **SENSITIVITY OF F-106B LEADING-EDGE-VORTEX IMAGES TO FLIGHT AND VAPOR-SCREEN PARAMETERS**

JOHN E. LAMAR and THOMAS D. JOHNSON, JR. (Planning Research Corp., Hampton, Va.) Jun. 1988 80 p Original contains color illustrations  
(NASA-TP-2818; L-16395; NAS 1.60:2818) Avail: NTIS HC  
A05/MF A01 CSCL 01A

F-106 AIRCRAFT, IMAGE PROCESSING, LEADING EDGES, SCREEN EFFECT, TRANSONIC FLIGHT, VAPORS, VORTICES, WINGS

**N88-28895\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **STEADY AND UNSTEADY TRANSONIC PRESSURE MEASUREMENTS ON A CLIPPED DELTA WING FOR PITCHING AND CONTROL-SURFACE OSCILLATIONS**

ROBERT W. HESS, F. W. CAZIER, JR., and ELEANOR C. WYNNE Washington, D.C. Oct. 1986 118 p MF as supplement

(NASA-TP-2594; L-16082; NAS 1.60:2594) Avail: NTIS HC  
A06/MF A01 CSCL 01A

CONTROL SURFACES, DELTA WINGS, LONGITUDINAL CONTROL, OSCILLATIONS, PRESSURE MEASUREMENT, STEADY STATE, WIND TUNNEL TESTS

**N88-29752\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **AERODYNAMICS IN GROUND EFFECT AND PREDICTED LANDING GROUND ROLL OF A FIGHTER CONFIGURATION WITH A SECONDARY-NOZZLE THRUST REVERSER**

DANIEL W. BANKS Oct. 1988 131 p  
(NASA-TP-2834; L-16435; NAS 1.60:2834) Avail: NTIS HC  
A07/MF A01 CSCL 01A

CASCADE FLOW, GROUND EFFECT (AERODYNAMICS), NOZZLE FLOW, ROLL, SHORT TAKEOFF AIRCRAFT, THRUST REVERSAL

**N89-10020\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **WEAK-WAVE ANALYSIS OF SHOCK INTERACTION WITH A SLIPSTREAM**

RAYMOND L. BARGER Nov. 1988 20 p  
(NASA-TP-2848; L-16469; NAS 1.60:2848) Avail: NTIS HC  
A03/MF A01 CSCL 01A

COUNTERFLOW, SHOCK WAVE INTERACTION, SLIPSTREAMS

**N89-10024\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **VALIDATION OF A PAIR OF COMPUTER CODES FOR ESTIMATION AND OPTIMIZATION OF SUBSONIC AERODYNAMIC PERFORMANCE OF SIMPLE HINGED-FLAP SYSTEMS FOR THIN SWEPT WINGS**

HARRY W. CARLSON (PRC Systems Services Co., Hampton, Va.) and CHRISTINE M. DARDEN Washington Nov. 1988 118 p  
(NASA-TP-2828; L-16428; NAS 1.60:2828) Avail: NTIS HC  
A06/MF A01 CSCL 01A

AERODYNAMICS, COMPUTER PROGRAMS, FLAPPING HINGES, OPTIMIZATION, SUBSONIC FLOW, SWEPT WINGS

**N89-10844\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

### **THREE COMPONENT LASER ANEMOMETER MEASUREMENTS IN AN ANNULAR CASCADE OF CORE TURBINE VANES WITH CONTOURED END WALL**

LOUIS J. GOLDMAN and RICHARD G. SEASHOLTZ Nov. 1988 44 p  
(NASA-TP-2846; E-4183; NAS 1.60:2846) Avail: NTIS HC  
A03/MF A01 CSCL 20D

ANNULAR FLOW, CASCADE FLOW, FABRY-PEROT

INTERFEROMETERS, FLOW MEASUREMENT, LASER  
ANEMOMETERS, STATOR BLADES, VELOCITY  
MEASUREMENT

**N89-10849\*#** National Aeronautics and Space Administration.  
Ames Research Center, Moffett Field, CA.

**THE 1987 GROUND VORTEX WORKSHOP**

RICHARD J. MARGASON, ed. Feb. 1988 216 p Workshop  
held at Moffett Field, Calif., 22-23 Apr. 1987  
(NASA-CP-10008; A-88008; NAS 1.55:10008) Avail: NTIS HC  
A10/MF A02 CSCL 01A

CONFERENCES, EXHAUST GASES, GROUND EFFECT  
(AERODYNAMICS), SHORT TAKEOFF AIRCRAFT, VERTICAL  
AIRCRAFT, VERTICAL TAKEOFF AIRCRAFT, VORTICES

**N89-12543\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**A SPECTRAL COLLOCATION SOLUTION TO THE  
COMPRESSIBLE STABILITY EIGENVALUE PROBLEM**

MICHELE G. MACARAEG, CRAIG L. STREETT, and M. YOUSUFF  
HUSSAINI Washington, D.C. Dec. 1988 42 p  
(NASA-TP-2858; L-16470; NAS 1.60:2858) Avail: NTIS HC  
A03/MF A01 CSCL 01A

BOUNDARY LAYER FLOW, COMPRESSIBLE FLOW,  
COMPUTATIONAL GRIDS, FLOW DISTRIBUTION, FLOW  
STABILITY, SHEAR FLOW

**N89-14213\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**THRUST-REVERSER FLOW INVESTIGATION ON A  
TWIN-ENGINE TRANSPORT**

GREGORY M. GATLIN and P. FRANK QUINTO Washington,  
DC Dec. 1988 156 p  
(NASA-TP-2856; L-16426; NAS 1.60:2856) Avail: NTIS HC  
A08/MF A01 CSCL 01A

ENGINE TESTS, FREE FLOW, GROUND EFFECT  
(AERODYNAMICS), REVERSED FLOW, THRUST REVERSAL,  
TRANSPORT AIRCRAFT

**N89-15888\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**INTEGRATION EFFECTS OF PYLON GEOMETRY ON A  
HIGH-WING TRANSPORT AIRPLANE**

JOHN R. CARLSON and MILTON LAMB Washington, DC Feb.  
1989 78 p  
(NASA-TP-2877; L-16489; NAS 1.60:2877) Avail: NTIS HC  
A05/MF A01 CSCL 01A

INSTALLING, NACELLES, PYLONS, TRANSPORT AIRCRAFT,  
WINGS

**N89-17568\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**NASA SC(2)-0714 AIRFOIL DATA CORRECTED FOR  
SIDEWALL BOUNDARY-LAYER EFFECTS IN THE LANGLEY  
0.3-METER TRANSONIC CRYOGENIC TUNNEL**

RENALDO V. JENKINS Washington, DC Mar. 1989 58 p  
(NASA-TP-2890; L-16385; NAS 1.60:2890) Avail: NTIS HC  
A04/MF A01 CSCL 01A

BOUNDARY LAYERS, CRYOGENIC WIND TUNNELS,  
SUPERCRITICAL AIRFOILS, WIND TUNNEL WALLS

**N89-17579\*#** National Aeronautics and Space Administration.  
Ames Research Center, Moffett Field, CA.

**TIP AERODYNAMICS AND ACOUSTICS TEST: A REPORT  
AND DATA SURVEY**

JEFFREY L. CROSS and MICHAEL E. WATTS Dec. 1988  
463 p  
(NASA-RP-1179; A-87128; NAS 1.61:1179) Avail: NTIS HC  
A20/MF A03 CSCL 01A

In a continuing effort to understand helicopter rotor tip  
aerodynamics and acoustics, a flight test was conducted by NASA  
Ames Research Center. The test was performed using the NASA  
White Cobra and a set of highly instrumented blades. All aspects  
of the flight test instrumentation and test procedures are explained.

Additionally, complete data sets for selected test points are  
presented and analyzed. Because of the high volume of data  
acquired, only selected data points are presented. However, access  
to the entire data set is available to the researcher on request.

Author

**N89-19232\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**DRAG MEASUREMENTS ON A LAMINAR-FLOW BODY OF  
REVOLUTION IN THE 13-INCH MAGNETIC SUSPENSION AND  
BALANCE SYSTEM**

DAVID A. DRESS 1989 37 p  
(NASA-TP-2895; L-16483; NAS 1.60:2895) Avail: NTIS HC  
A03/MF A01 CSCL 01A

AERODYNAMIC BALANCE, BODIES OF REVOLUTION, DRAG  
MEASUREMENT, LAMINAR FLOW, MAGNETIC SUSPENSION

**N89-19234\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**TRANSONIC UNSTEADY AERODYNAMICS AND  
AEROELASTICITY 1987, PART 1**

SAMUEL R. BLAND, comp. Washington, DC Feb. 1989  
261 p Symposium held in Hampton, VA, 20-22 May 1987  
(NASA-CP-3022-PT-1; L-16532-PT-1; NAS 1.55:3022-PT-1)  
Avail: NTIS HC A12/MF A02 CSCL 01A

AEROELASTICITY, AIRCRAFT CONFIGURATIONS,  
COMPUTATIONAL FLUID DYNAMICS, FLUTTER ANALYSIS,  
TRANSONIC FLOW, UNSTEADY AERODYNAMICS

**N89-19247\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**TRANSONIC UNSTEADY AERODYNAMICS AND  
AEROELASTICITY 1987, PART 2**

SAMUEL R. BLAND, comp. Washington, DC Feb. 1989  
379 p Symposium held in Hampton, VA, 20-22 May 1987  
(NASA-CP-3022-PT-2; L-16532-PT-2; NAS 1.55:3022-PT-2)  
Avail: NTIS HC A17/MF A03 CSCL 01A

AEROELASTICITY, AIRCRAFT STABILITY, FLOW  
DISTRIBUTION, TRANSONIC FLOW, UNSTEADY  
AERODYNAMICS, VISCOUS FLOW

**N89-20925\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**TRANSONIC SYMPOSIUM: THEORY, APPLICATION, AND  
EXPERIMENT, VOLUME 1, PART 1**

JEROME T. FOUGHNER, JR., comp. Mar. 1989 416 p  
Symposium held in Hampton, VA, 19-21 Apr. 1988; sponsored by  
NASA, Washington Original contains color illustrations  
(NASA-CP-3020-VOL-1-PT-1; L-16501-VOL-1-PT-1; NAS  
1.55:3020-VOL-1-PT-1) Avail: NTIS HC A18/MF A03 CSCL  
01A

AIRCRAFT DESIGN, COMPUTATIONAL FLUID DYNAMICS,  
CONFERENCES, FLIGHT TESTS, GRID GENERATION  
(MATHEMATICS), WIND TUNNEL TESTS

**N89-20942\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**TRANSONIC SYMPOSIUM: THEORY, APPLICATION, AND  
EXPERIMENT, VOLUME 1, PART 2**

JEROME T. FOUGHNER, JR., comp. Mar. 1989 511 p  
Symposium held in Hampton, VA, 19-21 Apr. 1988; sponsored by  
NASA, Washington Original contains color illustrations  
(NASA-CP-3020-VOL-1-PT-2; L-16501-VOL-1-PT-2; NAS  
1.55:3020-VOL-1-PT-2) Avail: NTIS HC A22/MF A03 CSCL  
01A

COMPUTATIONAL FLUID DYNAMICS, COMPUTERIZED  
SIMULATION, GRID GENERATION (MATHEMATICS),  
INTERACTIONAL AERODYNAMICS, TRANSONIC FLOW, WIND  
TUNNEL TESTS

**N89-23415\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**STATUS OF SONIC BOOM METHODOLOGY AND  
UNDERSTANDING**

## 02 AERODYNAMICS

CHRISTINE M. DARDEN, CLEMANS A. POWELL, WALLACE D. HAYES, ALBERT R. GEORGE, and ALLAN D. PIERCE (Pennsylvania State Univ., University Park.) Washington Jun. 1989 32 p Presented at the Sonic Boom Workshop, Hampton, VA, Jan. 1988  
(NASA-CP-3027; L-16567; NAS 1.55:3027) Avail: NTIS HC A03/MF A01 CSCL 01A  
NOISE PREDICTION (AIRCRAFT), SONIC BOOMS, SUPERSONIC FLIGHT

**N89-24264\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EFFECT OF ADVANCED ROTORCRAFT AIRFOIL SECTIONS ON THE HOVER PERFORMANCE OF A SMALL-SCALE ROTOR MODEL**  
SUSAN L. ALTHOFF (Army Aviation Systems Command, Hampton, VA.) Sep. 1988 35 p  
(DA PROJ. 1L1-61102-AH-45-A)  
(NASA-TP-2832; L-16407; NAS 1.60:2832; AVSCOM-TP-88-B-001) Avail: NTIS HC A03/MF A01 CSCL 01A  
AIRFOIL PROFILES, FLIGHT TESTS, HOVERING, ROTARY WINGS, ROTORCRAFT AIRCRAFT

**N89-25117\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EFFECT OF MILLING MACHINE ROUGHNESS AND WING DIHEDRAL ON THE SUPERSONIC AERODYNAMIC CHARACTERISTICS OF A HIGHLY SWEEPED WING**  
CHRISTINE M. DARDEN Washington Aug. 1989 88 p  
(NASA-TP-2918; L-16546; NAS 1.60:2918) Avail: NTIS HC A05/MF A01 CSCL 01A  
DIHEDRAL ANGLE, LIFT DRAG RATIO, MILLING (MACHINING), SUPERSONIC SPEED, SURFACE ROUGHNESS EFFECTS, SWEEPED WINGS

**N89-25118\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**INTERACTIONS OF TOLLMIEN-SCHLICHTING WAVES AND DEAN VORTICES. COMPARISON OF DIRECT NUMERICAL SIMULATION AND A WEAKLY NONLINEAR THEORY**  
BART A. SINGER (High Technology Corp., Hampton, VA.) and THOMAS A. ZANG Washington Aug. 1989 21 p  
(NASA-TP-2919; L-16559; NAS 1.60:2919) Avail: NTIS HC A03/MF A01 CSCL 01A  
CHANNEL FLOW, COMPUTERIZED SIMULATION, NONLINEAR SYSTEMS, TOLLMIEN-SCHLICHTING WAVES, VORTICES, WAVE INTERACTION

**N89-25951\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**STEADY-STATE AND TRANSITIONAL AERODYNAMIC CHARACTERISTICS OF A WING IN SIMULATED HEAVY RAIN**  
BRYAN A. CAMPBELL and GAUDY M. BEZOS Washington Aug. 1989 95 p  
(NASA-TP-2932; L-16576; NAS 1.60:2932) Avail: NTIS HC A05/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, AERODYNAMIC STALLING, AIRFOILS, RAIN, STEADY STATE, TRANSIENT RESPONSE, WINGS

**N89-26811\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**A PROCEDURE FOR COMPUTING SURFACE WAVE TRAJECTORIES ON AN INHOMOGENEOUS SURFACE**  
RAYMOND L. BARGER Washington Aug. 1989 14 p  
(NASA-TP-2929; L-16558; NAS 1.60:2929) Avail: NTIS HC A03/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, COMPUTATIONAL FLUID DYNAMICS, HYDRODYNAMICS, INHOMOGENEITY, MATHEMATICAL MODELS, SURFACE WAVES

**N89-27634\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**STATIC INTERNAL PERFORMANCE OF A NONAXISYMMETRIC VANED THRUST REVERSER WITH FLOW SPLAY CAPABILITY**  
LINDA S. BANGERT and LAURENCE D. LEAVITT Washington Sep. 1989 89 p  
(NASA-TP-2933; L-16552; NAS 1.60:2933) Avail: NTIS HC A05/MF A01 CSCL 01A  
DEFLECTORS, FLOW DEFLECTION, STATIC TESTS, THRUST REVERSAL, THRUST VECTOR CONTROL, WIND TUNNEL TESTS

**N90-10829\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**MEASUREMENTS OF PRESSURES ON THE TAIL AND AFT FUSELAGE OF AN AIRPLANE MODEL DURING ROTARY MOTIONS AT SPIN ATTITUDES**  
JAMES S. BOWMAN, JR., RANDY S. HULTBERG, and COLIN A. MARTIN (Aeronautical Research Labs., Melbourne, Australia) Washington Nov. 1989 85 p  
(NASA-TP-2939; L-16570; NAS 1.60:2939) Avail: NTIS HC A05/MF A01 CSCL 01A  
AIRCRAFT MODELS, FUSELAGES, PRESSURE MEASUREMENT, SPIN TESTS, TAIL ASSEMBLIES

**N90-10830\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**LOW-SPEED, HIGH-LIFT AERODYNAMIC CHARACTERISTICS OF SLENDER, HYPERSONIC ACCELERATOR-TYPE CONFIGURATIONS**  
GREGORY M. GATLIN Washington Nov. 1989 46 p  
(NASA-TP-2945; L-16537; NAS 1.60:2945) Avail: NTIS HC A03/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, AEROSPACE PLANES, AIRCRAFT DESIGN, BODY-WING CONFIGURATIONS, HYPERSONIC FLOW, LIFT

**N90-12503\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**RESEARCH IN NATURAL LAMINAR FLOW AND LAMINAR-FLOW CONTROL, PART 1**  
JERRY N. HEFNER, comp. and FRANCES E. SABO, comp. Dec. 1987 322 p Symposium held in Hampton, VA, 16-19 Mar. 1987  
(NASA-CP-2487-PT-1; L-16350-PT-1; NAS 1.55:2487-PT-1) Avail: NTIS HC A14/MF A02 CSCL 01A  
BOUNDARY LAYER CONTROL, BOUNDARY LAYER TRANSITION, CONFERENCES, FLOW STABILITY, LAMINAR BOUNDARY LAYER, LAMINAR FLOW, LAMINAR FLOW AIRFOILS

**N90-12519\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**RESEARCH IN NATURAL LAMINAR FLOW AND LAMINAR-FLOW CONTROL, PART 2**  
JERRY N. HEFNER, comp. and FRANCES E. SABO, comp. Dec. 1987 328 p Symposium held in Hampton, VA, 16-19 Mar. 1987  
(NASA-CP-2487-PT-2; L-16350-PT-2; NAS 1.55:2487-PT-2) Avail: NTIS HC A15/MF A02 CSCL 01A  
AIRCRAFT DESIGN, BOUNDARY LAYER CONTROL, BOUNDARY LAYER TRANSITION, COMPUTATIONAL FLUID DYNAMICS, CONFERENCES, LAMINAR BOUNDARY LAYER, LAMINAR FLOW, LAMINAR FLOW AIRFOILS, WIND TUNNEL TESTS

**N90-12539\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**RESEARCH IN NATURAL LAMINAR FLOW AND LAMINAR-FLOW CONTROL, PART 3**  
JERRY N. HEFNER, comp. and FRANCES E. SABO, comp. Dec. 1987 399 p Symposium held in Hampton, VA, 16-19 Mar.



- 1987  
(NASA-CP-2487-PT-3; L-16350-PT-3; NAS 1.55:2487-PT-3)  
Avail: NTIS HC A17/MF A03 CSCL 01A  
AIRCRAFT DESIGN, BOUNDARY LAYER CONTROL, BOUNDARY LAYER STABILITY, BOUNDARY LAYER TRANSITION, CONFERENCES, LAMINAR FLOW, LAMINAR FLOW AIRFOILS
- N90-14185\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**MEASURED AND PREDICTED AERODYNAMIC COEFFICIENTS AND SHOCK SHAPES FOR AEROASSIST FLIGHT EXPERIMENT (AFE) CONFIGURATION**  
WILLIAM L. WELLS 1989 52 p  
(NASA-TP-2956; L-16644; NAS 1.60:2956) Avail: NTIS HC A04/MF A01 CSCL 01A  
AEROASSIST, AERODYNAMIC CHARACTERISTICS, AERODYNAMIC COEFFICIENTS, AERODYNAMIC CONFIGURATIONS, BLUNT BODIES, HYPERSONIC FLOW, HYPERSONIC VEHICLES, NORMAL SHOCK WAVES, WIND TUNNEL TESTS
- N90-14187\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**VALIDATION OF A COMPUTER CODE FOR ANALYSIS OF SUBSONIC AERODYNAMIC PERFORMANCE OF WINGS WITH FLAPS IN COMBINATION WITH A CANARD OR HORIZONTAL TAIL AND AN APPLICATION TO OPTIMIZATION**  
HARRY W. CARLSON (PRC Systems Services Co., Hampton, VA.), CHRISTINE M. DARDEN, and MICHAEL J. MANN Jan. 1990 125 p  
(NASA-TP-2961; L-16611; NAS 1.60:2961) Avail: NTIS HC A06/MF A01 CSCL 01A  
CANARD CONFIGURATIONS, COMPUTER PROGRAMS, FLAPS (CONTROL SURFACES), HORIZONTAL TAIL SURFACES, PROGRAM VERIFICATION (COMPUTERS)
- N90-15682\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**ROTOR INDUCED-INFLOW-RATIO MEASUREMENTS AND CAMRAD CALCULATIONS**  
DANNY R. HOAD Washington Jan. 1990 28 p Original contains color illustrations  
(DA PROJ. 1L1-62211-A-47-AA)  
(NASA-TP-2946; L-16594; NAS 1.60:2946; AVSCOM-TM-89-B-010; AD-A219296) Avail: NTIS HC A03/MF A01 CSCL 01/1  
BLADE TIPS, BLADE-VORTEX INTERACTION, COMPUTER PROGRAMS, FLOW MEASUREMENT, HELICOPTER WAKES, INLET FLOW, MATHEMATICAL MODELS
- N90-16710\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**NASA SUPERCRITICAL AIRFOILS: A MATRIX OF FAMILY-RELATED AIRFOILS**  
CHARLES D. HARRIS Washington Mar. 1990 73 p  
(NASA-TP-2969; L-16625; NAS 1.60:2969) Avail: NTIS HC A04/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, AIRCRAFT DESIGN, SUPERCRITICAL AIRFOILS
- N90-19193\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**STATIC INVESTIGATION OF A TWO-DIMENSIONAL CONVERGENT-DIVERGENT EXHAUST NOZZLE WITH MULTIAxis THRUST-VECTORING CAPABILITY**  
JOHN G. TAYLOR Washington Apr. 1990 104 p  
(NASA-TP-2973; L-16632; NAS 1.60:2973) Avail: NTIS HC A06/MF A01 CSCL 01A  
CONVERGENT-DIVERGENT NOZZLES, EXHAUST NOZZLES, NOZZLE DESIGN, NOZZLE EFFICIENCY, STATIC TESTS, THRUST VECTOR CONTROL
- N90-19200\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**INTERNAL PERFORMANCE OF TWO NOZZLES UTILIZING GIMBAL CONCEPTS FOR THRUST VECTORING**  
BOBBY L. BERRIER and JOHN G. TAYLOR Washington Apr. 1990 128 p  
(NASA-TP-2991; L-16722; NAS 1.60:2991) Avail: NTIS HC A07/MF A01 CSCL 01A  
CONVERGENT-DIVERGENT NOZZLES, GIMBALS, NOZZLE EFFICIENCY, NOZZLE GEOMETRY, THRUST VECTOR CONTROL
- N90-20046\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EXPERIMENTAL AND THEORETICAL AERODYNAMIC CHARACTERISTICS OF A HIGH-LIFT SEMISPAN WING MODEL**  
ZACHARY T. APPLIN and GARL L. GENTRY, JR. Washington May 1990 111 p  
(NASA-TP-2990; L-16441; NAS 1.60:2990) Avail: NTIS HC A06/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, AERODYNAMIC CONFIGURATIONS, AIRFOIL PROFILES, BOUNDARY LAYER CONTROL, COMPUTER PROGRAMS, LAMINAR BOUNDARY LAYER, PANEL METHOD (FLUID DYNAMICS), SEMISPAN MODELS
- N90-20946\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**DISCRETE-VORTEX MODEL FOR THE SYMMETRIC-VORTEX FLOW ON CONES**  
THOMAS G. GAINER Washington May 1990 29 p  
(NASA-TP-2989; L-16586; NAS 1.60:2989) Avail: NTIS HC A03/MF A01 CSCL 01A  
CONICAL BODIES, FLOW DISTRIBUTION, MATHEMATICAL MODELS, POTENTIAL FLOW, VORTICES
- N90-22531\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**DYNAMIC GROUND-EFFECT MEASUREMENTS ON THE F-15 STOL AND MANEUVER TECHNOLOGY DEMONSTRATOR (S/MTD) CONFIGURATION**  
GUY T. KEMMERLY Washington Jun. 1990 31 p  
(NASA-TP-3000; L-16555; NAS 1.60:3000) Avail: NTIS HC A03/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, AIRCRAFT CONFIGURATIONS, AIRCRAFT LANDING, F-15 AIRCRAFT, GROUND EFFECT (AERODYNAMICS), GROUND TESTS, SHORT TAKE-OFF AIRCRAFT
- N90-24239\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**AERODYNAMIC CHARACTERISTICS OF TWO ROTORCRAFT AIRFOILS DESIGNED FOR APPLICATION TO THE INBOARD REGION OF A MAIN ROTOR BLADE**  
KEVIN W. NOONAN (Army Aerostructures Directorate, Hampton, VA.) Washington Jul. 1990 89 p  
(DA PROJ. 1L1-62211-A-47-AA)  
(NASA-TP-3009; L-16737; NAS 1.60:3009; AVSCOM-TR-90-B-005) Avail: NTIS HC A05/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, AERODYNAMIC COEFFICIENTS, ROTARY WINGS, ROTORCRAFT AIRCRAFT
- N90-25938\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EFFECT OF TAIL SIZE REDUCTIONS ON LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A THREE SURFACE F-15 MODEL WITH NONAXISYMMETRIC NOZZLES**  
MARK C. FRASSINELLI (Air Force Wright Aeronautical Labs., Wright-Patterson AFB, OH.) and GEORGE T. CARSON, JR. Washington Aug. 1990 59 p

## 02 AERODYNAMICS

(NASA-TP-3036; L-16800; NAS 1.60:3036) Avail: NTIS HC A04/MF A01 CSCL 01A  
AERODYNAMIC CHARACTERISTICS, CANARD CONFIGURATIONS, F-15 AIRCRAFT, NOZZLE FLOW, NOZZLE GEOMETRY, TAIL ASSEMBLIES, TRANSONIC WIND TUNNELS

**N90-27649\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**THE LANGLEY 14- BY 22-FOOT SUBSONIC TUNNEL: DESCRIPTION, FLOW CHARACTERISTICS, AND GUIDE FOR USERS**

GARL L. GENTRY, JR., P. FRANK QUINTO, GREGORY M. GATLIN, and ZACHARY T. APPLIN Washington Sep. 1990 73 p

(NASA-TP-3008; L-16731; NAS 1.60:3008) Avail: NTIS HC A04/MF A01 CSCL 01A

DATA ACQUISITION, FLOW CHARACTERISTICS, GROUND EFFECT (AERODYNAMICS), SUBSONIC WIND TUNNELS, USER REQUIREMENTS, WIND TUNNEL APPARATUS

**N90-28503\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**THE EFFECTS OF STRUCTURAL FLAP-LAG AND PITCH-LAG COUPLING ON SOFT INPLANE HINGELESS ROTOR STABILITY IN HOVER**

WILLIAM G. BOUSMAN Washington May 1990 65 p  
Sponsored by Army Aviation Systems Command, Saint Louis, MO  
Prepared in cooperation with Army Aviation Systems Command, Moffett Field, CA

(NASA-TP-3002; A-89093; NAS 1.60:3002; AVSCOM-TR-89-A-002; AD-A226087) Avail: NTIS HC A04/MF A01 CSCL 01/1

COUPLING, HOVERING, HOVERING STABILITY, MATHEMATICAL MODELS, RIGID ROTORS, ROTARY WINGS

## 03

### AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

**N87-10054\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**DOPPLER RADAR DETECTION OF WIND SHEAR**

V. E. DELNORE, Comp. (PRC Kentron, Inc., Hampton, Va.) and V. A. MCCLELLAN (Research Triangle Inst., Research Triangle Park, N.C.) Sep. 1985 118 p Presented at a Meeting, Hampton, Va., 24-25 Sep., 1985; sponsored in part by FAA

(NASA-CP-2435; NAS 1.55:2435; FAA/PM-86/31) Avail: NTIS HC A06/MF A01 CSCL 01C

AIRCRAFT HAZARDS, AVIATION METEOROLOGY, CONFERENCES, DOPPLER RADAR, MICROBURSTS (METEOROLOGY), RADAR MEASUREMENT, WIND SHEAR

**N87-22634\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**COCKPIT RESOURCE MANAGEMENT TRAINING**

HARRY W. ORLADY, ed. (Orlady Associates, Inc., Los Gatos, Calif.) and H. CLAYTON FOUSHEE, ed. May 1987 308 p  
Workshop held in San Francisco, Calif., 6-8 May 1986; sponsored by NASA. Ames Research Center and Air Force Military Airlift

(NASA-CP-2455; A-87038; NAS 1.55:2455) Avail: NTIS HC A14/MF A02 CSCL 01C

FLIGHT CREWS, FLIGHT SIMULATION, FLIGHT TRAINING, GROUP DYNAMICS, PERSONNEL MANAGEMENT

**N87-29469\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**JET TRANSPORT FLIGHT OPERATIONS USING COCKPIT DISPLAY OF TRAFFIC INFORMATION DURING INSTRUMENT METEOROLOGICAL CONDITIONS: SIMULATION EVALUATION**  
DAVID H. WILLIAMS and DOUGLAS C. WELLS May 1986 50 p

(NASA-TP-2567; L-16091; NAS 1.60:2567) Avail: NTIS HC A03/MF A01 CSCL 01C

AIR TRAFFIC CONTROL, COCKPIT SIMULATORS, DISPLAY DEVICES, INSTRUMENT APPROACH, JET AIRCRAFT, TRANSPORT AIRCRAFT, VIDEO COMMUNICATION, WORKLOADS (PSYCHOPHYSIOLOGY)

**N88-14970\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**WIND SHEAR DETECTION. FORWARD-LOOKING SENSOR TECHNOLOGY**

E. M. BRACALANTE, comp. and V. E. DELNORE, comp. (PRC Kentron, Inc., Hampton, Va.) Oct. 1987 282 p Presented at the 1st Industry Review, Hampton, Va., 24-25 Feb. 1987

(NASA-CP-10004; NAS 1.55:10004; DOT/FAA/PS-87/2) Avail: NTIS HC A13/MF A02 CSCL 01C

AEROSPACE INDUSTRY, CONFERENCES, DOPPLER RADAR, FLIR DETECTORS, REMOTE SENSING, WIND SHEAR

**N88-17616\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**AIRBORNE WIND SHEAR DETECTION AND WARNING SYSTEMS: FIRST COMBINED MANUFACTURERS' AND TECHNOLOGISTS' CONFERENCE**

AMOS A. SPADY, JR., comp., ROLAND L. BOWLES, comp., and HERBERT SCHLICKENMAIER, comp. (Federal Aviation Administration, Washington, D.C.) Jan. 1988 558 p Conference held in Hampton, Va., 22-23 Oct. 1987

(NASA-CP-10006; NAS 1.55:10006; DOT/FAA/PS-88/7) Avail: NTIS HC A24/MF A03 CSCL 01C

AIRBORNE EQUIPMENT, AIRCRAFT CONTROL, CONFERENCES, DETECTION, DOPPLER RADAR, INFORMATION TRANSFER, OPTICAL RADAR, WARNING SYSTEMS, WIND SHEAR

**N88-21144\*#** National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, VA.

**INVESTIGATION OF THE MISFUELING OF RECIPROCATING PISTON AIRCRAFT ENGINES**

J. HOLLAND SCOTT, JR. Mar. 1988 82 p

(NASA-TP-2803; NAS 1.60:2803) Avail: NTIS HC A05/MF A01 CSCL 01C

AIRCRAFT ENGINES, ERRORS, GENERAL AVIATION AIRCRAFT, PISTON ENGINES, REFUELING

**N88-26344\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**INFLUENCE OF WIND SHEAR ON THE AERODYNAMIC CHARACTERISTICS OF AIRPLANES**

DAN D. VICROY Aug. 1988 62 p Sponsored by NASA, Washington, D.C. and DOT, Washington, D.C.

(NASA-TP-2827; L-16439; NAS 1.60:2827; DOT/FAA/PS-88/15) Avail: NTIS HC A04/MF A01 CSCL 01C

AERODYNAMIC CHARACTERISTICS, AIRCRAFT CONTROL, MICROBURSTS (METEOROLOGY), SHEAR FLOW, WIND SHEAR

04

**AIRCRAFT COMMUNICATIONS AND NAVIGATION**

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

**N89-11726\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A SIMULATOR INVESTIGATION OF THE USE OF DIGITAL DATA LINK FOR PILOT/ATC COMMUNICATIONS IN A SINGLE PILOT OPERATION**

DAVID A. HINTON and GARY W. LOHR (Embry-Riddle Aeronautical Univ., Daytona Beach, Fla.) Jun. 1988 41 p (NASA-TP-2837; L-16457; NAS 1.60:2837) Avail: NTIS HC A03/MF A01 CSCL 17B

DATA TRANSMISSION, DIGITAL DATA, PILOT PERFORMANCE, RADIO COMMUNICATION, SIMULATION, VOICE COMMUNICATION

**N89-15900\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A PILOTTED SIMULATION STUDY OF DATA LINK ATC MESSAGE EXCHANGE**

MARVIN C. WALLER and GARY W. LOHR (Embry-Riddle Aeronautical Univ., Daytona Beach, FL.) Washington, DC Feb. 1989 38 p (NASA-TP-2859; L-16450; NAS 1.60:2859) Avail: NTIS HC A03/MF A01 CSCL 17B

AIR TRAFFIC CONTROL, DATA LINKS, FLIGHT SIMULATION, MESSAGE PROCESSING

**N89-15901\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**SIMULATION EVALUATION OF TIMER, A TIME-BASED, TERMINAL AIR TRAFFIC, FLOW-MANAGEMENT CONCEPT**

LEONARD CREDEUR and WILLIAM R. CAPRON (PRC Kentron, Inc., Hampton, VA.) Washington, DC Feb. 1989 69 p (NASA-TP-2870; L-16386; NAS 1.60:2870) Avail: NTIS HC A04/MF A01 CSCL 17G

AIR TRAFFIC CONTROL, AUTOMATIC CONTROL, EVALUATION, MANAGEMENT PLANNING, SCHEDULING, SIMULATION, TERMINAL FACILITIES

**N90-18378\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**DELIVERY PERFORMANCE OF CONVENTIONAL AIRCRAFT BY TERMINAL-AREA, TIME-BASED AIR TRAFFIC CONTROL: A REAL-TIME SIMULATION EVALUATION**

LEONARD CREDEUR, JACOB A. HOUCK, WILLIAM R. CAPRON, and GARY W. LOHR (Embry-Riddle Aeronautical Univ., Daytona Beach, FL.) Washington Apr. 1990 66 p (NASA-TP-2978; L-16615; NAS 1.60:2978) Avail: NTIS HC A04/MF A01 CSCL 17G

AIR TRAFFIC CONTROL, AIR TRAFFIC CONTROLLERS (PERSONNEL), COMPUTERIZED SIMULATION, FLIGHT CREWS, PILOT PERFORMANCE, REAL TIME OPERATION

05

**AIRCRAFT DESIGN, TESTING AND PERFORMANCE**

Includes aircraft simulation technology.

**N87-11717\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**RECENT EXPERIENCES IN MULTIDISCIPLINARY ANALYSIS AND OPTIMIZATION, PART 1**

J. SOBIESKI, comp. 1984 517 p Symposium held in Hampton, Va., 24-26 Apr. 1984

(NASA-CP-2327-PT-1; NAS 1.55:2327-PT-1) Avail: NTIS HC A22/MF A03 CSCL 01C

AIRCRAFT DESIGN, COMPUTER AIDED DESIGN, CONFERENCES, DESIGN ANALYSIS, OPTIMIZATION, STRUCTURAL DESIGN

**N87-11750\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**RECENT EXPERIENCES IN MULTIDISCIPLINARY ANALYSIS AND OPTIMIZATION, PART 2**

J. SOBIESKI, comp. 1984 509 p Symposium held in Hampton, Va., 24-26 Apr. 1984

(NASA-CP-2327-PT-2; L-15830; NAS 1.55:2327-PT-2) Avail: NTIS HC A22/MF A03 CSCL 01C

AIRCRAFT DESIGN, COMPUTER AIDED DESIGN, HELICOPTERS, OPTIMIZATION

**N87-15959\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**LARGE-SCALE STATIC INVESTIGATION OF CIRCULATION-CONTROL-WING CONCEPTS APPLIED TO UPPER SURFACE-BLOWING AIRCRAFT**

M. D. SHOVLIN, R. J. ENGLAR (Naval Ship Research and Development Center, Bethesda, Md.), J. C. EPEL, and J. H. NICHOLS, JR. Jan. 1987 65 p

(NASA-TP-2684; NAS 1.60:2684) Avail: NTIS HC A04/MF A01 CSCL 01C

CIRCULATION CONTROL AIRFOILS, GROUND TESTS, LIFT AUGMENTATION, SHORT TAKEOFF AIRCRAFT, STATIC TESTS, THRUST CONTROL, TURBOFAN ENGINES, UPPER SURFACE BLOWING

**N87-16815\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**FLIGHT INVESTIGATION OF THE EFFECT OF TAIL CONFIGURATION ON STALL, SPIN, AND RECOVERY CHARACTERISTICS OF A LOW-WING GENERAL AVIATION RESEARCH AIRPLANE**

H. PAUL STOUGH, III, JAMES M. PATTON, JR., and STEVEN M. SLIWA Feb. 1987 125 p

(NASA-TP-2644; L-16194; NAS 1.60:2644) Avail: NTIS HC A06/MF A01 CSCL 01C

AERODYNAMIC CONFIGURATIONS, AERODYNAMIC STALLING, AIRCRAFT SPIN, GENERAL AVIATION AIRCRAFT, RESEARCH AIRCRAFT, TAIL ASSEMBLIES

**N87-17690\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EXPLOITING SYMMETRIES IN THE MODELING AND ANALYSIS OF TIRES**

AHMED K. NOOR (Joint Inst. for Advancement of Flight Sciences, Hampton, Va.), CARL M. ANDERSEN (College of William and Mary, Hampton, Va.), and JOHN A. TANNER Mar. 1987 63 p (NCC1-40)

(NASA-TP-2649; L-16185; NAS 1.60:2649) Avail: NTIS HC A04/MF A01 CSCL 01C

FINITE ELEMENT METHOD, MATHEMATICAL MODELS, SYMMETRY, TIRES

## 05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

**N87-17693\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EFFECTS OF EMPENNAGE SURFACE LOCATION ON AERODYNAMIC CHARACTERISTICS OF A TWIN-ENGINE AFTERBODY MODEL WITH NONAXISYMMETRIC NOZZLES**

FRANCIS J. CAPONE and GEORGE T. CARSON, JR. Feb. 1985 79 p

(NASA-TP-2392; L-15825; NAS 1.60:2392) Avail: NTIS HC A05/MF A01 CSCL 01C

AERODYNAMIC CHARACTERISTICS, AERODYNAMIC DRAG, AFTERBODIES, AXISYMMETRIC BODIES, FIGHTER AIRCRAFT, NOZZLE GEOMETRY, TAIL ASSEMBLIES, TAIL SURFACES

**N87-20990\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**SUMMARY OF STUDIES TO REDUCE WING-MOUNTED PROPPAN INSTALLATION DRAG ON AN  $M = 0.8$  TRANSPORT**

RONALD C. SMITH, ALAN D. LEVIN, and RICHARD D. WOOD May 1987 29 p

(NASA-TP-2678; A-86242; NAS 1.60:2678) Avail: NTIS HC A03/MF A01 CSCL 01C

DRAG REDUCTION, HIGH SPEED, PROP-FAN TECHNOLOGY, TRANSPORT AIRCRAFT, WIND TUNNEL TESTS

**N87-23614\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**FLIGHT INVESTIGATION OF THE EFFECTS OF AN OUTBOARD WING-LEADING-EDGE MODIFICATION ON STALL/SPIN CHARACTERISTICS OF A LOW-WING, SINGLE-ENGINE, T-TAIL LIGHT AIRPLANE**

H. PAUL STOUGH, III, DANIEL J. DICARLO, and JAMES M. PATTON, JR. Jul. 1987 117 p

(NASA-TP-2691; L-16243; NAS 1.60:2691) Avail: NTIS HC A06/MF A01 CSCL 01A

AERODYNAMIC STALLING, FLIGHT TESTS, INVESTIGATION, LEADING EDGES, REVISIONS, SPIN, WINGS

**N87-24458\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**MEASUREMENTS OF FLOW RATE AND TRAJECTORY OF AIRCRAFT TIRE-GENERATED WATER SPRAY**

ROBERT H. DAUGHERTY and SANDY M. STUBBS Jul. 1987 118 p

(NASA-TP-2718; L-16195; NAS 1.60:2718) Avail: NTIS HC A06/MF A01 CSCL 01C

AIRCRAFT TIRES, ENGINE INLETS, FLOW VELOCITY, INGESTION (ENGINES), SPLASHING, SPRAYING

**N87-26041\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EVALUATION OF INSTALLED PERFORMANCE OF A WING-TIP-MOUNTED PUSHER TURBOPROP ON A SEMISPAN WING**

JAMES C. PATTERSON, JR. and GLYNN R. BARTLETT Aug. 1987 30 p

(NASA-TP-2739; L-16252; NAS 1.60:2739) Avail: NTIS HC A03/MF A01 CSCL 01C

INSTALLING, PROPELLERS, SEMISPAN MODELS, TURBOFAN ENGINES, TURBOPROP ENGINES, WING TIP VORTICES

**N87-29497\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**QUALITATIVE EVALUATION OF A FLUSH AIR DATA SYSTEM AT TRANSONIC SPEEDS AND HIGH ANGLES OF ATTACK**

TERRY J. LARSON, STEPHEN A. WHITMORE, L. J. EHERNBERGER, J. BLAIR JOHNSON, and PAUL M. SIEMERS, III Washington NASA Apr. 1987 64 p

(NASA-TP-2716; H-1277; NAS 1.60:2716) Avail: NTIS HC A04/MF A01 CSCL 01C

AIR DATA SYSTEMS, ANGLE OF ATTACK, FLOW

DISTRIBUTION, ORIFICE FLOW, PITOT TUBES, STAGNATION PRESSURE, TRANSONIC SPEED

**N87-29499\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.

**APPLICATION OF PARAMETER ESTIMATION TO AIRCRAFT STABILITY AND CONTROL: THE OUTPUT-ERROR APPROACH**

RICHARD E. MAINE and KENNETH W. ILIFF Jun. 1986 175 p Submitted for publication

(NASA-RP-1168; H-1299; NAS 1.61:1168) Avail: NTIS HC A08/MF A01 CSCL 01C

The practical application of parameter estimation methodology to the problem of estimating aircraft stability and control derivatives from flight test data is examined. The primary purpose of the document is to present a comprehensive and unified picture of the entire parameter estimation process and its integration into a flight test program. The document concentrates on the output-error method to provide a focus for detailed examination and to allow us to give specific examples of situations that have arisen. The document first derives the aircraft equations of motion in a form suitable for application to estimation of stability and control derivatives. It then discusses the issues that arise in adapting the equations to the limitations of analysis programs, using a specific program for an example. The roles and issues relating to mass distribution data, preflight predictions, maneuver design, flight scheduling, instrumentation sensors, data acquisition systems, and data processing are then addressed. Finally, the document discusses evaluation and the use of the analysis results. Author

**N88-12480\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EFFECT OF MOTION CUES DURING COMPLEX CURVED APPROACH AND LANDING TASKS: A PILOTED SIMULATION STUDY**

CHARLES H. SCANLON (Arkansas State Univ., State University.) Dec. 1987 28 p

(NCC1-107)

(NASA-TP-2773; L-16351; NAS 1.60:2773) Avail: NTIS HC A03/MF A01 CSCL 01C

APPROACH, CUES, LANDING, MICROWAVE LANDING SYSTEMS, MOTION, PILOT PERFORMANCE, TRACKING (POSITION), WORKLOADS (PSYCHOPHYSIOLOGY)

**N88-18583\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**CORNERING CHARACTERISTICS OF THE MAIN-GEAR TIRE OF THE SPACE SHUTTLE ORBITER**

ROBERT H. DAUGHERTY, SANDY M. STUBBS, and MARTHA P. ROBINSON Mar. 1988 29 p

(NASA-TP-2790; L-16370; NAS 1.60:2790) Avail: NTIS HC A03/MF A01 CSCL 01C

AERODYNAMIC LOADS, COEFFICIENTS, LANDING GEAR, SPACE SHUTTLES, TIRES, YAWING MOMENTS

**N88-19467\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**A PERSPECTIVE ON 15 YEARS OF PROOF-OF-CONCEPT AIRCRAFT DEVELOPMENT AND FLIGHT RESEARCH AT AMES-MOFFETT BY THE ROTORCRAFT AND POWERED-LIFT FLIGHT PROJECTS DIVISION, 1970-1985**

DAVID D. FEW Aug. 1987 55 p

(NASA-RP-1187; A-86404; NAS 1.61:1187) Avail: NTIS HC A04/MF A01 CSCL 01C

A proof-of-concept (POC) aircraft is defined and the concept of interest described for each of the six aircraft developed by the Ames-Moffett Rotorcraft and Powered-Lift Flight Projects Division from 1970 through 1985; namely, the OV-10, the C-8A Augmentor Wing, the Quiet Short-Haul Research Aircraft (QSRA), the XV-15 Tilt Rotor Research Aircraft (TRRA), the Rotor Systems Research Aircraft (RSRA)-compound, and the yet-to-fly RSRA/X-Wing Aircraft. The program/project chronology and most noteworthy features of the concepts are reviewed. The paper discusses the significance of each concept and the project demonstrating it; it

## 05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

briefly looks at what concepts are on the horizon as potential POC research aircraft and emphasizes that no significant advanced concept in aviation technology has ever been accepted by civilian or military users without first completing a demonstration through flight testing. Author

**N88-21153\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**DEVELOPMENT AND FLIGHT TEST OF AN EXPERIMENTAL MANEUVER AUTOPILOT FOR A HIGHLY MANEUVERABLE AIRCRAFT**

EUGENE L. DUKE, FRANK P. JONES, and RALPH B. RONCOLI  
Sep. 1986 61 p  
(NASA-TP-2618; H-1258; NAS 1.60:2618) Avail: NTIS HC A04/MF A01 CSCL 01C

AUTOMATIC CONTROL. AUTOMATIC PILOTS, FLIGHT TESTS, HIGHLY MANEUVERABLE AIRCRAFT

**N88-21157\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**STATIC MECHANICAL PROPERTIES OF 30 X 11.5 - 14.5, TYPE 8 AIRCRAFT TIRES OF BIAS-PLY AND RADIAL-BELTED DESIGN**

PAMELA A. DAVIS and MERCEDES C. LOPEZ May 1988 24 p  
(NASA-TP-2810; L-16374; NAS 1.60:2810) Avail: NTIS HC A03/MF A01 CSCL 01C

AIRCRAFT TIRES, MECHANICAL PROPERTIES, STATIC TESTS

**N88-22031\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**SHAPE SENSITIVITY ANALYSIS OF WING STATIC AEROELASTIC CHARACTERISTICS**

JEAN-FRANCOIS M. BARTHELEMY and FRED D. BERGEN (Virginia Polytechnic Inst. and State Univ., Blacksburg.) May 1988 30 p  
(NASA-TP-2808; L-16418; NAS 1.60:2808) Avail: NTIS HC A03/MF A01 CSCL 01C

AEROELASTICITY, DYNAMIC RESPONSE, SENSITIVITY, WING LOADING, WING PROFILES

**N88-24623\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**NONLINEAR PROGRAMMING EXTENSIONS TO RATIONAL FUNCTION APPROXIMATION METHODS FOR UNSTEADY AERODYNAMIC FORCES**

SHERWOOD H. TIFFANY and WILLIAM M. ADAMS, JR. Jul. 1988 55 p Previously announced in IAA as A87-33694  
Sponsored by NASA, Washington  
(NASA-TP-2776; L-16205; NAS 1.60:2776) Avail: NTIS HC A04/MF A01 CSCL 01C

AERODYNAMIC FORCES, AERODYNAMICS, APPROXIMATION, EQUATIONS OF MOTION, FLEXIBLE BODIES, NON-LINEAR PROGRAMMING, OPTIMIZATION

**N89-23448\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**HOT-JET SIMULATION IN CRYOGENIC WIND TUNNELS**

KEISUKE ASAI (National Aerospace Lab., Tokyo, Japan) Washington Jul. 1989 49 p  
(NASA-RP-1220; L-16564; NAS 1.61:1220) Avail: NTIS HC A03/MF A01 CSCL 01C

In order to evaluate hot jet simulation capability in cryogenic wind tunnel testing, simple theoretical calculations were performed. The similarity parameters, isentropic flow properties, and normal shock relations were calculated for a variety of jet simulation techniques. The results were compared with those estimated for a full scale flight condition. It was shown that the cryogenic wind tunnel testing provides an opportunity for the most accurate hot jet simulation technique. By using a compressed nitrogen gas at ambient or moderately elevated temperatures as a jet gas, most all of the relevant similarity parameters including the jet temperature

and velocity ratios and the Reynolds numbers, can be set to the full scale flight values. The only exception is the ratio of specific heats for jet flow. In an attempt to match the ratio of specific heats for the turbojet flow, gases other than pure nitrogen were considered. It was found that a nitrogen/methane mixture at moderately elevated temperature behaves like the real combustion gas. Using this mixture as a jet gas, complete simulation of the full scale turbojet exhaust becomes possible in cryogenic wind tunnels. Author

**N89-25146\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**RECENT ADVANCES IN MULTIDISCIPLINARY ANALYSIS AND OPTIMIZATION, PART 1**

JEAN-FRANCOIS M. BARTHELEMY, ed. Washington Apr. 1989 527 p Symposium held in Hampton, VA, 28-30 Sep. 1988; sponsored by NASA, Langley Research Center, NASA, LeResear Center, and Wright Research Development Center  
(NASA-CP-3031-PT-1; L-16568-PT-1; NAS 1.55:3031-PT-1)  
Avail: NTIS HC A23/MF A03 CSCL 01C

AIRCRAFT DESIGN, COMPUTATIONAL FLUID DYNAMICS, COMPUTER AIDED DESIGN, CONFERENCES, EXPERT SYSTEMS, OPTIMIZATION, STRUCTURAL ENGINEERING

**N89-25173\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**RECENT ADVANCES IN MULTIDISCIPLINARY ANALYSIS AND OPTIMIZATION, PART 2**

JEAN-FRANCOIS M. BARTHELEMY, ed. Washington Apr. 1989 501 p Symposium held in Hampton, VA, 28-30 Sep. 1988; sponsored by NASA, Langley Research Center, NASA, Lewis Research Center, and Wright Research Development Center  
(NASA-CP-3031-PT-2; L-16568-PT-2; NAS 1.55:3031-PT-2)  
Avail: NTIS HC A22/MF A03 CSCL 01C

AIRCRAFT DESIGN, ARTIFICIAL INTELLIGENCE, COMPUTER AIDED DESIGN, CONFERENCES, DESIGN ANALYSIS, OPTIMIZATION, STRUCTURAL ANALYSIS, STRUCTURAL DESIGN

**N89-25201\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**RECENT ADVANCES IN MULTIDISCIPLINARY ANALYSIS AND OPTIMIZATION, PART 3**

JEAN-FRANCOIS M. BARTHELEMY, ed. Washington Apr. 1989 513 p Symposium held in Hampton, VA, 28-30 Sep. 1988; sponsored by NASA, Langley Research Center, NASA, Lewis Research Center, and Wright Research Development Center  
(NASA-CP-3031-PT-3; L-16568-PT-3; NAS 1.55:3031-PT-3)  
Avail: NTIS HC A22/MF A03 CSCL 01C

AIRCRAFT DESIGN, COMPUTER AIDED DESIGN, COMPUTERIZED SIMULATION, CONFERENCES, CONTROL THEORY, DESIGN ANALYSIS, FLEXIBLE SPACECRAFT, LARGE SPACE STRUCTURES, OPTIMIZATION, SPACECRAFT DESIGN, STRUCTURAL DESIGN, STRUCTURAL ENGINEERING, SYSTEMS ENGINEERING

**N89-26844\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**METHOD FOR EXPERIMENTAL DETERMINATION OF FLUTTER SPEED BY PARAMETER IDENTIFICATION**

E. NISSIM (Technion - Israel Inst. of Tech., Haifa.) and GLENN B. GILYARD Washington Jun. 1989 44 p Previously announced in IAA as A89-30801  
(NASA-TP-2923; H-1510; NAS 1.60:2923) Avail: NTIS HC A03/MF A01 CSCL 01C

AEROELASTICITY, DYNAMIC PRESSURE, FLIGHT TESTS, FLUTTER, PARAMETER IDENTIFICATION

**N90-12589\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**POWERED-LIFT AIRCRAFT TECHNOLOGY**  
W. H. DECKERT and J. A. FRANKLIN 1989 36 p Original

## 05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

contains color illustrations

(NASA-SP-501; NAS 1.21:501; LC-89-39482) Avail: SOD HC \$4.25 as 033-000-01062-1; NTIS HC A03/MF A01 CSCL 01C

Powered lift aircraft have the ability to vary the magnitude and direction of the force produced by the propulsion system so as to control the overall lift and streamwise force components of the aircraft, with the objective of enabling the aircraft to operate from minimum sized terminal sites. Power lift technology has contributed to the development of the jet lift Harrier and to the forth coming operational V-22 Tilt Rotor and the C-17 military transport. This technology will soon be expanded to include supersonic fighters with short takeoff and vertical landing capability, and will continue to be used for the development of short- and vertical-takeoff and landing transport. An overview of this field of aeronautical technology is provided for several types of powered lift aircraft. It focuses on the description of various powered lift concepts and their operational capability. Aspects of aerodynamics and flight controls pertinent to powered lift are also discussed. Author

**N90-14220\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **GLOBAL STRATOSPHERIC CHANGE: REQUIREMENTS FOR A VERY-HIGH-ALTITUDE AIRCRAFT FOR ATMOSPHERIC RESEARCH**

1989 41 p Workshop held in Truckee, CA, 15-16 Jul. 1989 (NASA-CP-10041; A-89243; NAS 1.55:10041) Avail: NTIS HC A03/MF A01 CSCL 01C

ATMOSPHERIC CHEMISTRY, FLIGHT CHARACTERISTICS, METEOROLOGICAL FLIGHT, REMOTE SENSING, STRATOSPHERE, U-2 AIRCRAFT

**N90-15100\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **THE EFFECTIVENESS OF VANE-AILERON EXCITATION IN THE EXPERIMENTAL DETERMINATION OF FLUTTER SPEED BY PARAMETER IDENTIFICATION**

ELI NISSIM (Technion - Israel Inst. of Tech., Haifa.) Jan. 1990 23 p

(NASA-TP-2971; H-1516; NAS 1.60:2971) Avail: NTIS HC A03/MF A01 CSCL 01C

EXCITATION, FLUTTER, PARAMETER IDENTIFICATION, VANES

**N90-15902\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **EVALUATION OF TWO TRANSPORT AIRCRAFT AND SEVERAL GROUND TEST VEHICLE FRICTION MEASUREMENTS OBTAINED FOR VARIOUS RUNWAY SURFACE TYPES AND CONDITIONS. A SUMMARY OF TEST RESULTS FROM JOINT FAA/NASA RUNWAY FRICTION PROGRAM**

THOMAS J. YAGER, WILLIAM A. VOGLER (PRC Kentron, Inc., Hampton, VA.), and PAUL BALDASARE Washington Feb. 1990 301 p

(NASA-TP-2917; L-16536; NAS 1.60:2917) Avail: NTIS HC A14/MF A02 CSCL 01C

AIRCRAFT TIRES, ASPHALT, CONCRETES, FRICTION MEASUREMENT, GROUND TESTS, RUNWAY CONDITIONS, TRANSPORT AIRCRAFT

**N90-17627\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **SIMULATED-AIRLINE-SERVICE FLIGHT TESTS OF LAMINAR-FLOW CONTROL WITH PERFORATED-SURFACE SUCTION SYSTEM**

DAL V. MADDALON and ALBERT L. BRASLOW (Analytical Services and Materials, Inc., Hampton, VA.) Washington Mar. 1990 40 p

(NASA-TP-2966; L-16589; NAS 1.60:2966) Avail: NTIS HC A03/MF A01 CSCL 01C

BOUNDARY LAYER CONTROL, C-140 AIRCRAFT, LAMINAR FLOW, LEADING EDGES, PERFORATION, SUCTION

**N90-18385\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **FUSELAGE DESIGN FOR A SPECIFIED MACH-SLICED AREA DISTRIBUTION**

RAYMOND L. BARGER and MARY S. ADAMS Washington Feb. 1990 88 p

(NASA-TP-2975; L-16651; NAS 1.60:2975) Avail: NTIS HC A05/MF A01 CSCL 01C

AIRCRAFT CONFIGURATIONS, AIRCRAFT DESIGN, FUSELAGES, MACH NUMBER, NOISE REDUCTION

**N90-25134\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.

### **EVALUATION OF VARIOUS THRUST CALCULATION TECHNIQUES ON AN F404 ENGINE**

RONALD J. RAY Apr. 1990 31 p

(NASA-TP-3001; H-1505; NAS 1.60:3001) Avail: NTIS HC A03/MF A01 CSCL 21E

CALIBRATING, ENGINE TESTS, FLIGHT TESTS, PERFORMANCE PREDICTION, REAL TIME OPERATION, THRUST

**N90-26823\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **EVALUATION OF ENERGY ABSORPTION OF NEW CONCEPTS OF AIRCRAFT COMPOSITE SUBFLOOR INTERSECTIONS**

LISA E. JONES (PRC Kentron, Inc., Hampton, VA.) and HUEY D. CARDEN Washington Nov. 1989 33 p

(NASA-TP-2951; L-16628; NAS 1.60:2951) Avail: NTIS HC A03/MF A01 CSCL 01C

AIRCRAFT CONSTRUCTION MATERIALS, CRASHWORTHINESS, FLOORS, LAMINATES, STRUCTURAL ANALYSIS, STRUCTURAL FAILURE, SUBSTRUCTURES

## 06

### AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

**N87-10864\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **GROUND-BASED TIME-GUIDANCE ALGORITHM FOR CONTROL OF AIRPLANES IN A TIME-METERED AIR TRAFFIC CONTROL ENVIRONMENT: A PILOTED SIMULATION STUDY**

C. E. KNOX and N. IMBERT (Office National d'Etudes et de Recherches Aerospatiales, Toulouse, France) Nov. 1986 36 p

(NASA-TP-2616; L-16116; NAS 1.60:2616) Avail: NTIS HC A03/MF A01 CSCL 01D

AIR TRAFFIC CONTROL, ENERGY CONSERVATION, FLIGHT MANAGEMENT SYSTEMS, FLIGHT SIMULATION, FUEL CONSUMPTION, PILOTS (PERSONNEL), TIMING DEVICES

**N87-13438\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **DEVELOPMENT AND EVALUATION OF AN AIRPLANE ELECTRONIC DISPLAY FORMAT ALIGNED WITH THE INERTIAL VELOCITY VECTOR**

G. G. STEINMETZ Dec. 1986 23 p

(NASA-TP-2648; L-16168; NAS 1.60:2648) Avail: NTIS HC A03/MF A01 CSCL 01D

ALIGNMENT, DIRECTIONAL CONTROL, DISPLAY DEVICES, ELECTRONIC EQUIPMENT, FLIGHT TESTS, INERTIAL NAVIGATION, PERFORMANCE TESTS, VELOCITY

**N87-19393\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **A SIMULATION EVALUATION OF A PILOT INTERFACE WITH AN AUTOMATIC TERMINAL APPROACH SYSTEM**

## 07 AIRCRAFT PROPULSION AND POWER

DAVID A. HINTON Apr. 1987 21 p  
(NASA-TP-2669; L-16222; NAS 1.60:2669) Avail: NTIS HC  
A03/MF A01 CSCL 17G

APPROACH CONTROL, AUTOMATIC CONTROL, AUTOMATIC  
PILOTS, GENERAL AVIATION AIRCRAFT, MAN MACHINE  
SYSTEMS

**N87-29533\*#** National Aeronautics and Space Administration.  
Ames Research Center, Moffett Field, CA.

### ANALOG SIGNAL CONDITIONING FOR FLIGHT-TEST INSTRUMENTATION

DONALD W. VEATCH and RODNEY K. BOGUE Washington  
NASA Jan. 1986 173 p Presented at the AGARD Flight  
Mechanics Panel, Flight-test Techniques Working Group,  
AGARDograph 160, Flight-Test Instrumentation Series Previously  
announced as N86-29816

(NASA-RP-1159; H-1191; NAS 1.61:1159) Avail: NTIS HC  
A08/MF A01 CSCL 01D

The application of analog signal conditioning to flight-tests data  
acquisition systems is discussed. Emphasis is placed on practical  
applications of signal conditioning for the most common flight-test  
data-acquisition systems. A limited amount of theoretical discussion  
is included to assist the reader in a more complete understanding  
of the subject matter. Nonspecific signal conditioning, such as  
amplification, filtering, and multiplexing, is discussed. Signal  
conditioning for various specific transducers and data terminal  
devices is also discussed to illustrate signal conditioning that is  
unique to particular types of transducers. The purpose is to  
delineate for the reader the various signal-conditioning technique  
options, together with tradeoff considerations, for commonly  
encountered flight-test situations. Author

**N88-12487\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### EFFECTS OF COMBINING VERTICAL AND HORIZONTAL INFORMATION INTO A PRIMARY FLIGHT DISPLAY

TERENCE S. ABBOTT, MARK NATAUPSKY, and GEORGE G.  
STEINMETZ Dec. 1987 21 p

(NASA-TP-2783; L-16366; NAS 1.60:2783) Avail: NTIS HC  
A03/MF A01 CSCL 01D

COCKPITS, CONSOLIDATION, DISPLAY DEVICES,  
HORIZONTAL ORIENTATION, POSITION INDICATORS,  
VERTICAL ORIENTATION

**N89-16820\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### PILOTED-SIMULATION EVALUATION OF ESCAPE GUIDANCE FOR MICROBURST WIND SHEAR ENCOUNTERS M.S. Thesis - George Washington Univ.

DAVID A. HINTON Washington, DC Mar. 1989 57 p Sponsored  
in part by FAA, Washington, DC

(NASA-TP-2886; L-16498; NAS 1.60:2886; DOT/FAA/DS-89/06)  
Avail: NTIS HC A04/MF A01 CSCL 01D

FLIGHT HAZARDS, FLIGHT SIMULATION, MICROBURSTS  
(METEOROLOGY), PILOT PERFORMANCE, WIND SHEAR

**N90-13384\*#** National Aeronautics and Space Administration.  
Ames Research Center, Moffett Field, CA.

### FLIGHT DECK AUTOMATION: PROMISES AND REALITIES

SUSAN D. NORMAN, ed. and HARRY W. ORLADY, ed. (Orlady  
Associates, Inc., Los Gatos, CA.) Sep. 1989 200 p Proceedings  
of a NASA/FAA/Industry Workshop, Carmel Valley, CA, 1-4 Aug.  
1988

(NASA CP-10036; A-89196; NAS 1.55:10036) Avail: NTIS HC  
A09/MF A02 CSCL 01D

AIR TRAFFIC CONTROL, AIR TRANSPORTATION,  
AUTOMATIC CONTROL, COCKPITS, CONFERENCES,  
MAN-COMPUTER INTERFACE

**N90-18393\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### A SIMULATION EVALUATION OF THE ENGINE MONITORING AND CONTROL SYSTEM DISPLAY

TERENCE S. ABBOTT Washington Feb. 1990 39 p Original  
contains color illustrations

(NASA-TP-2960; L-16637; NAS 1.60:2960) Avail: NTIS HC  
A03/MF A01; 6 functional color pages CSCL 01D

AIRCRAFT INSTRUMENTS, DISPLAY DEVICES, ENGINE  
MONITORING INSTRUMENTS, FLIGHT INSTRUMENTS

**N90-21004\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### STEREOPSIS CUEING EFFECTS ON HOVER-IN-TURBULENCE PERFORMANCE IN A SIMULATED ROTORCRAFT

RUSSELL V. PARRISH and STEVEN P. WILLIAMS (Army Aviation  
Systems Command, Hampton, VA.) Washington May 1990  
62 p

(DA PROJ. 1L1-61102-AH-45)

(NASA-TP-2980; L-16652; NAS 1.60:2980;

AVSCOM-TR-90-B-002; AD-A224484) Avail: NTIS HC A04/MF  
A01 CSCL 01/4

CUES, DISPLAY DEVICES, FLIGHT SIMULATION, HOVERING,  
PILOT PERFORMANCE, ROTARY WING AIRCRAFT,  
TURBULENCE

**N90-25980\*#** National Aeronautics and Space Administration,  
Washington, DC.

### SPACE TRANSPORTATION AVIONICS TECHNOLOGY SYMPOSIUM. VOLUME 1: EXECUTIVE SUMMARY

Aug. 1990 24 p Symposium held in Williamsburg, VA, 7-9  
Nov. 1989

(NASA-CP-3081-VOL-1; NAS 1.55:3081-VOL-1) Avail: NTIS HC  
A03/MF A01 CSCL 01D

AVIONICS, CONFERENCES, SPACE TRANSPORTATION

## 07

## AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g.,  
gas turbine engines and compressors; and onboard auxiliary power  
plants for aircraft.

**N87-17699\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

### DESIGN OF 9.271-PRESSURE-RATIO 5-STAGE CORE COMPRESSOR AND OVERALL PERFORMANCE FOR FIRST 3 STAGES

RONALD J. STEINKE May 1986 35 p

(NASA-TP-2597; E-2589; NAS 1.60:2597) Avail: NTIS HC  
A03/MF A01 CSCL 21E

COMPRESSORS, DESIGN ANALYSIS, FLOW DISTRIBUTION,  
PERFORMANCE TESTS, ROTOR BLADES (TURBOMACHINERY)

**N87-20267\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

### NASA-CHINESE AERONAUTICAL ESTABLISHMENT (CAE) SYMPOSIUM

1986 230 p Symposium held in Cleveland, Ohio, 23-27 Sep.  
1985

(NASA-CP-2433; E-3033; NAS 1.55:2433) Avail: NTIS HC  
A11/MF A02 CSCL 21E

COMBUSTION, FLUID DYNAMICS, THERMODYNAMICS

**N87-24481\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

### LOW-COST FM OSCILLATOR FOR CAPACITANCE TYPE OF BLADE TIP CLEARANCE MEASUREMENT SYSTEM

JOHN P. BARRANGER Jul. 1987 16 p

(NASA-TP-2746; E-3455; NAS 1.60:2746) Avail: NTIS HC  
A03/MF A01 CSCL 21E

## 07 AIRCRAFT PROPULSION AND POWER

BLADE TIPS, ERROR ANALYSIS, FREQUENCY MODULATION, NONDESTRUCTIVE TESTS, OSCILLATORS, ROTOR BLADES (TURBOMACHINERY)

**N88-15785\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**AEROPROPULSION '87. SESSION 2: AEROPROPULSION STRUCTURES RESEARCH**  
Nov. 1987 52 p Conference held in Cleveland, Ohio, 17-19  
Nov. 1987 Submitted for publication  
(NASA-CP-10003-SESS-2; E-3798-SESS-2; NAS 1.55:10003-SESS-2) Avail: NTIS HC A04/MF A01 CSCL 21E  
CONTROL SYSTEMS DESIGN, DESIGN ANALYSIS, PROPULSION SYSTEM CONFIGURATIONS, STRUCTURAL ANALYSIS

**N88-15790\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**AEROPROPULSION '87. SESSION 3: INTERNAL FLUID MECHANICS RESEARCH**  
Nov. 1987 75 p Conference held in Cleveland, Ohio, 17-19  
Nov. 1987 Submitted for publication  
(NASA-CP-10003-SESS-3; E-3798-SESS-3; NAS 1.55:10003-SESS-3) Avail: NTIS HC A04/MF A01 CSCL 21E  
CHEMICAL REACTIONS, DUCTS, FLUID MECHANICS, INLET FLOW, NOZZLES, PREDICTION ANALYSIS TECHNIQUES, PROPULSION, TURBOMACHINERY

**N88-15794\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**AEROPROPULSION '87. SESSION 4: INSTRUMENTATION AND CONTROLS RESEARCH**  
Nov. 1987 77 p Conference held in Cleveland, Ohio, 17-19  
Nov. 1987 Submitted for publication  
(NASA-CP-10003-SESS-4; E-3798-SESS-4; NAS 1.55:10003-SESS-4) Avail: NTIS HC A05/MF A01 CSCL 21E  
CONFERENCES, CONTROL SYSTEMS DESIGN, FIBER OPTICS, FLUID MECHANICS, MEASURING INSTRUMENTS, PROPULSION

**N88-15800\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**AEROPROPULSION '87. SESSION 5: SUBSONIC PROPULSION TECHNOLOGY**  
Nov. 1987 153 p Conference held in Cleveland, Ohio, 17-19  
Nov. 1987 Submitted for publication  
(NASA-CP-10003-SESS-5; E-3798-SESS-5; NAS 1.55:10003-SESS-5) Avail: NTIS HC A08/MF A01 CSCL 21E  
CONFERENCES, ENGINE DESIGN, FLUID MECHANICS, PROP-FAN TECHNOLOGY, PROPULSION

**N88-15807\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**AEROPROPULSION '87. SESSION 6: HIGH-SPEED PROPULSION TECHNOLOGY**  
Nov. 1987 119 p Conference held in Cleveland, Ohio, 17-19  
Nov. 1987 Submitted for publication  
(NASA-CP-10003-SESS-6; E-3798-SESS-6; NAS 1.55:10003-SESS-6) Avail: NTIS HC A06/MF A01 CSCL 21E  
CONFERENCES, FLUID MECHANICS, HYPERSONIC AIRCRAFT, PROPULSION SYSTEM CONFIGURATIONS, SUPERSONIC AIRCRAFT, SUPERSONIC COMBUSTION RAMJET ENGINES, TRANSPORT AIRCRAFT

**N88-16697\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**AEROPROPULSION '87. SESSION 1: AEROPROPULSION MATERIALS RESEARCH**  
Nov. 1987 121 p Conference held in Cleveland, Ohio, 17-19  
Nov. 1987 Submitted for publication  
(NASA-CP-10003-SESS-1; E-3798-SESS-1; NAS 1.55:10003-SESS-1) Avail: NTIS HC A06/MF A01 CSCL 21E  
CERAMICS, CREEP PROPERTIES, ENGINE DESIGN, ENGINE

PARTS, FATIGUE (MATERIALS), METAL MATRIX COMPOSITES, POLYMER MATRIX COMPOSITES

**N89-12565\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**ADVANCED TURBOPROP PROJECT**  
ROY D. HAGER and DEBORAH VRABEL (Sverdrup Technology, Inc., Cleveland, Ohio.) 1988 130 p Original contains color illustrations  
(NASA-SP-495; NAS 1.21:495; LC88-1690) Avail: NTIS HC A07/MF A01 CSCL 21E

At the direction of Congress, a task force headed by NASA was organized in 1975 to identify potential fuel saving concepts for aviation. The result was the Aircraft Energy Efficiency (ACEE) Program implemented in 1976. An important part of the program was the development of advanced turboprop technology for Mach 0.65 to 0.85 applications having the potential fuel saving of 30 to 50 percent relative to existing turbofan engines. A historical perspective is presented of the development and the accomplishments that brought the turboprop to successful flight tests in 1986 and 1987. Author

**N90-21037\*#** Sverdrup Technology, Inc., Cleveland, OH.  
**EXHAUST NOZZLES FOR PROPULSION SYSTEMS WITH EMPHASIS ON SUPERSONIC CRUISE AIRCRAFT**  
LEONARD E. STITT May 1990 107 p  
(NAS3-25266)  
(NASA-RP-1235; E-4789; NAS 1.61:1235) Avail: NTIS HC A06/MF A01 CSCL 21E

This compendium summarizes the contributions of the NASA-Lewis and its contractors to supersonic exhaust nozzle research from 1963 to 1985. Two major research and technology efforts sponsored this nozzle research work; the U.S. Supersonic Transport (SST) Program and the follow-on Supersonic Cruise Research (SCR) Program. They account for two generations of nozzle technology: the first from 1963 to 1971, and the second from 1971 to 1985. First, the equations used to calculate nozzle thrust are introduced. Then the general types of nozzles are presented, followed by a discussion of those types proposed for supersonic aircraft. Next, the first-generation nozzles designed specifically for the Boeing SST and the second-generation nozzles designed under the SCR program are separately reviewed and then compared. A chapter on throttle-dependent afterbody drag is included, since drag has a major effect on the off-design performance of supersonic nozzles. A chapter on the performance of supersonic dash nozzles follows, since these nozzles have similar design problems. Finally, the nozzle test facilities used at NASA-Lewis during this nozzle research effort are identified and discussed. These facilities include static test stands, a transonic wind tunnel, and a flying testbed aircraft. A concluding section points to the future: a third generation of nozzles designed for a new era of high speed civil transports to produce even greater advances in performance, to meet new noise rules, and to ensure the continuity of over two decades of NASA research. Author

**N90-23403\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**EXPERIMENTAL EVALUATION OF A TUNED ELECTROMAGNETIC DAMPER FOR VIBRATION CONTROL OF CRYOGENIC TURBOPUMP ROTORS**  
ELISEO DIRUSSO and GERALD V. BROWN Washington Jun. 1990 17 p  
(NASA-TF-3005; E-5012; NAS 1.60:3005) Avail: NTIS HC A03/MF A01 CSCL 21E

CRYOGENIC TEMPERATURE, ELECTROMAGNETISM, ROCKET ENGINES, ROTOR SPEED, ROTORS, SHAFTS (MACHINE ELEMENTS), TURBINE PUMPS, VIBRATION DAMPING

**N90-27722\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**COMPUTER CODE FOR PREDICTING COOLANT FLOW AND HEAT TRANSFER IN TURBOMACHINERY**



PETER L. MEITNER Washington Sep. 1990 41 p Prepared in cooperation with Army Aviation Systems Command, Cleveland, OH  
(DA PROJ. 1L1-61102-AH-45)  
(NASA-TP-2985; E-5186; NAS 1.60:2985; AVSCOM-TR-89-C-008)  
Avail: NTIS HC A03/MF A01 CSCL 21E  
COMPUTER PROGRAMS, ENGINE COOLANTS, FLOW DISTRIBUTION, HEAT TRANSFER, TURBOMACHINERY

## 08

## AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

**N87-10103\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**IN-FLIGHT TOTAL FORCES, MOMENTS AND STATIC AEROELASTIC CHARACTERISTICS OF AN OBLIQUE-WING RESEARCH AIRPLANE**  
R. E. CURRY and A. G. SIM Oct. 1984 30 p  
(NASA-TP-2224; H-1181; NAS 1.60:2224) Avail: NTIS HC A03/MF A01 CSCL 01C

AEROELASTIC RESEARCH WINGS, AIRCRAFT DESIGN, FLIGHT TESTS, OBLIQUE WINGS, RESEARCH AIRCRAFT, STRUCTURAL DESIGN, WIND TUNNEL TESTS

**N87-10870\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**INTERFERENCE EFFECTS OF THRUST REVERSING ON HORIZONTAL TAIL EFFECTIVENESS OF TWIN-ENGINE FIGHTER AIRCRAFT AT MACH NUMBERS FROM 0.15 TO 0.90**  
F. J. CAPONE and M. L. MASON Oct. 1984 104 p  
(NASA-TP-2350; L-15811; NAS 1.60:2350) Avail: NTIS HC A06/MF A01 CSCL 01C

AERODYNAMIC INTERFERENCE, FIGHTER AIRCRAFT, TAIL ASSEMBLIES, THRUST REVERSAL, WIND TUNNEL TESTS

**N87-10871\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**FLIGHT-DETERMINED AERODYNAMIC DERIVATIVES OF THE AD-1 OBLIQUE-WING RESEARCH AIRPLANE**  
A. G. SIM and R. E. CURRY Oct. 1984 40 p  
(NASA-TP-2222; H-1179; NAS 1.60:2222) Avail: NTIS HC A03/MF A01 CSCL 01C

AERODYNAMIC COEFFICIENTS, OBLIQUE WINGS, RESEARCH AIRCRAFT, VARIABLE SWEEP WINGS

**N87-16849\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**PILOTED SIMULATOR STUDY OF ALLOWABLE TIME DELAYS IN LARGE-AIRPLANE RESPONSE**  
WILLIAM D. GRANTHAM, PAUL M. SMITH (PRC Kentron, Inc., Hampton, Va.), LEE H. PERSON, JR., ROBERT T. MEYER (Lockheed-Georgia Co., Marietta), and STEPHEN A. TINGAS Feb. 1987 69 p  
(NASA-TP-2652; L-16149; NAS 1.60:2652) Avail: NTIS HC A04/MF A01 CSCL 01C  
CONTROL SYSTEMS DESIGN, FLIGHT CHARACTERISTICS, FLIGHT SIMULATORS, LOW SPEED, TIME LAG, TRANSPORT AIRCRAFT

**N87-18570\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**FLIGHT CHARACTERISTICS OF THE AD-1 OBLIQUE-WING RESEARCH AIRCRAFT**  
ALEX G. SIM and ROBERT E. CURRY Mar. 1985 29 p  
(NASA-TP-2223; H-1180; NAS 1.60:2223) Avail: NTIS HC A03/MF A01 CSCL 01C

AERODYNAMIC CONFIGURATIONS, FLIGHT CHARACTERISTICS, LOW SPEED, OBLIQUE WINGS, RESEARCH AIRCRAFT

**N87-25331\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**ADVANCED DETECTION, ISOLATION AND ACCOMMODATION OF SENSOR FAILURES: REAL-TIME EVALUATION**  
WALTER C. MERRILL, JOHN C. DELAAT, and WILLIAM M. BRUTON Jul. 1987 30 p  
(NASA-TP-2740; E-3479; NAS 1.60:2740) Avail: US Patent and Trademark Office CSCL 01C

ENGINE CONTROL, ENGINE FAILURE, FAULT TOLERANCE, REDUNDANCY ENCODING, REMOTE SENSORS, TURBINE ENGINES

**N87-26922\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**PILOTED-SIMULATION STUDY OF EFFECTS OF VORTEX FLAPS ON LOW-SPEED HANDLING QUALITIES OF A DELTA-WING AIRPLANE**  
JAY M. BRANDON, PHILIP W. BROWN, and ALFRED J. WUNSCHER Sep. 1987 38 p  
(NASA-TP-2747; L-16307; NAS 1.60:2747) Avail: NTIS HC A03/MF A01 CSCL 01C

CONTROLLABILITY, DELTA WINGS, FLIGHT SIMULATION, LOW SPEED, PILOTS (PERSONNEL), VORTEX FLAPS

**N88-14987\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**HANDLING QUALITIES OF A WIDE-BODY TRANSPORT AIRPLANE UTILIZING PITCH ACTIVE CONTROL SYSTEMS (PACS) FOR RELAXED STATIC STABILITY APPLICATION**  
WILLIAM D. GRANTHAM, LEE H. PERSON, JR., PHILIP W. BROWN, LAWRENCE E. BECKER, GEORGE E. HUNT, J. J. RISING, W. J. DAVIS, C. S. WILLEY, W. A. WEAVER, and R. COKELEY Dec. 1985 109 p  
(NASA-TP-2482; L-15928; NAS 1.60:2482) Avail: NTIS HC A06/MF A01 CSCL 01C

ACTIVE CONTROL, FLIGHT CHARACTERISTICS, FLIGHT SIMULATION, PITCH (INCLINATION), STATIC STABILITY, TRANSPORT AIRCRAFT

**N88-19475\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**ROTORCRAFT FLIGHT-PROPULSION CONTROL INTEGRATION: AN ECLECTIC DESIGN CONCEPT**  
JAMES R. MIHALOE, MARK G. BALLIN, and D. C. G. RUTTLEDGE (Sikorsky Aircraft, Stratford, Conn.) Apr. 1988 34 p  
(NASA-TP-2815; E-3812; NAS 1.60:2815) Avail: NTIS HC A03/MF A01 CSCL 01C  
AIRCRAFT CONTROL, DESIGN ANALYSIS, INTEGRATORS, PROPULSIVE EFFICIENCY, ROTARY WING AIRCRAFT

**N89-12569\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**SINGULAR PERTURBATIONS AND TIME SCALES IN THE DESIGN OF DIGITAL FLIGHT CONTROL SYSTEMS**  
DESINENI S. NAIDU (Old Dominion Univ., Norfolk, Va.) and DOUGLAS B. PRICE Washington, D.C. Dec. 1988 30 p  
(NASA-TP-2844; L-16440; NAS 1.60:2844) Avail: NTIS HC A03/MF A01 CSCL 01C  
DIGITAL SYSTEMS, FLIGHT CONTROL, OPTIMAL CONTROL, PERTURBATION THEORY

**N89-15123\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.  
**DERIVATION AND DEFINITION OF A LINEAR AIRCRAFT MODEL**  
EUGENE L. DUKE, ROBERT F. ANTONIEWICZ, and KEITH D. KRAMBEER Aug. 1988 106 p  
(NASA-RP-1207; H-1391; NAS 1.61:1207) Avail: NTIS HC A06/MF A01 CSCL 01C

## 08 AIRCRAFT STABILITY AND CONTROL

A linear aircraft model for a rigid aircraft of constant mass flying over a flat, nonrotating earth is derived and defined. The derivation makes no assumptions of reference trajectory or vehicle symmetry. The linear system equations are derived and evaluated along a general trajectory and include both aircraft dynamics and observation variables. Author

**N89-15929\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.  
**FLIGHT CONTROL SYSTEMS DEVELOPMENT AND FLIGHT TEST EXPERIENCE WITH THE HIMAT RESEARCH VEHICLES**  
ROBERT W. KEMPEL and MICHAEL R. EARLS Jun. 1988 88 p  
(NASA-TP-2822; H-1428; NAS 1.60:2822) Avail: NTIS HC A05/MF A01 CSCL 01C

DIGITAL SYSTEMS, FLIGHT CONTROL, FLIGHT TESTS, HIGHLY MANEUVERABLE AIRCRAFT, REMOTELY PILOTED VEHICLES, RESEARCH AIRCRAFT, SCALE MODELS

**N89-15930\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.  
**A PILOTED EVALUATION OF AN OBLIQUE-WING RESEARCH AIRCRAFT MOTION SIMULATION WITH DECOUPLING CONTROL LAWS**  
ROBERT W. KEMPEL, WALTER E. MCNEILL, GLENN B. GILYARD, and TRINDEL A. MAINE Nov. 1988 52 p  
(NASA-TP-2874; H-1430; NAS 1.60:2874) Avail: NTIS HC A04/MF A01 CSCL 01C

DECOUPLING, EVALUATION, FLIGHT SIMULATION, FLIGHT TESTS, OBLIQUE WINGS, PILOT PERFORMANCE

**N89-16845\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**MODAL CONTROL OF AN OBLIQUE WING AIRCRAFT**  
JAMES D. PHILLIPS Jan. 1989 49 p  
(NASA-TP-2898; A-88250; NAS 1.60:2898) Avail: NTIS HC A03/MF A01 CSCL 01C  
FLIGHT CONTROL, MODAL RESPONSE, OBLIQUE WINGS, RESEARCH AIRCRAFT

**N89-19309\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**INTEGRATED TOOLS FOR CONTROL-SYSTEM ANALYSIS**  
AARON J. OSTROFF, MELISSA S. PROFFITT, and DAVID R. CLARK (Planning Research Corp., Hampton, VA.) Washington NASA Mar. 1989 61 p  
(NASA-TP-2885; L-16482; NAS 1.60:2885) Avail: NTIS HC A04/MF A01 CSCL 01C

ACTUATORS, COMPUTER PROGRAMS, CONTROL SYSTEMS DESIGN, CONTROLLERS, LINEAR SYSTEMS, SOFTWARE TOOLS, SYSTEMS ANALYSIS

**N89-23468\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**A CLOSED-FORM TRIM SOLUTION YIELDING MINIMUM TRIM DRAG FOR AIRPLANES WITH MULTIPLE LONGITUDINAL-CONTROL EFFECTORS**  
KENNETH H. GOODRICH, STEVEN M. SLIWA, and FREDERICK J. LALLMAN Washington May 1989 30 p  
(NASA-TP-2907; L-16484; NAS 1.60:2907) Avail: NTIS HC A03/MF A01 CSCL 01C

AERODYNAMIC BALANCE, AIRCRAFT DESIGN, COMPUTATION, LIFT DEVICES, OPTIMIZATION, REDUNDANCY, THRUST VECTOR CONTROL

**N89-23469\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**SIMULATOR EVALUATION OF A DISPLAY FOR A TAKEOFF PERFORMANCE MONITORING SYSTEM**  
DAVID B. MIDDLETON, RAGHAVACHARI SRIVATSAN, and LEE H. PERSON, JR. Washington May 1989 29 p  
(NASA-TP-2908; L-16510; NAS 1.60:2908) Avail: NTIS HC A03/MF A01 CSCL 01C

ABORTED MISSIONS, DISPLAY DEVICES, MONITORS, RATINGS, SIMULATORS, TAKEOFF

**N89-24327\*#** National Aeronautics and Space Administration. Flight Research Center, Edwards, CA.  
**DEVELOPMENT AND FLIGHT TEST EXPERIENCES WITH A FLIGHT-CRUCIAL DIGITAL CONTROL SYSTEM**  
DALE A. MACKALL Washington Nov. 1988 116 p  
(NASA-TP-2857; H-1344; NAS 1.60:2857) Avail: NTIS HC A06/MF A01 CSCL 01C  
AIRCRAFT PERFORMANCE, CONTROL SYSTEMS DESIGN, DIGITAL SYSTEMS, F-16 AIRCRAFT, FLIGHT CONTROL, SYSTEMS INTEGRATION

**N90-10074\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**ANALYSIS OF FLIGHT DATA FROM A HIGH-INCIDENCE RESEARCH MODEL BY SYSTEM IDENTIFICATION METHODS**  
JAMES G. BATTERSON and VLADISLAV KLEIN (Joint Inst. for Advancement of Flight Sciences, Hampton, VA.) Washington Nov. 1989 50 p  
(NASA-TP-2940; L-16571; NAS 1.60:2940) Avail: NTIS HC A03/MF A01 CSCL 01C  
AERODYNAMIC CONFIGURATIONS, AERODYNAMIC STABILITY, ANGLE OF ATTACK, DYNAMIC CONTROL, FLIGHT CHARACTERISTICS, STABILITY DERIVATIVES

**N90-11757\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**COMPARISON OF FLYING QUALITIES DERIVED FROM IN-FLIGHT AND GROUND-BASED SIMULATORS FOR A JET-TRANSPORT AIRPLANE FOR THE APPROACH AND LANDING PILOT TASKS**  
WILLIAM D. GRANTHAM Washington Dec. 1989 32 p  
(NASA-TP-2962; L-16609; NAS 1.60:2962) Avail: NTIS HC A03/MF A01 CSCL 01C  
FLIGHT CHARACTERISTICS, FLIGHT CONTROL, FLIGHT SIMULATION, JET AIRCRAFT, TRANSPORT AIRCRAFT

**N90-15112\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**ADVANCED DETECTION, ISOLATION, AND ACCOMMODATION OF SENSOR FAILURES IN TURBOFAN ENGINES: REAL-TIME MICROCOMPUTER IMPLEMENTATION**  
JOHN C. DELAAT and WALTER C. MERRILL Washington Feb. 1990 28 p  
(NASA-TP-2925; E-4391; NAS 1.60:2925) Avail: NTIS HC A03/MF A01 CSCL 01C  
ALGORITHMS, DIGITAL ELECTRONICS, ELECTRONIC CONTROL, ENGINE TESTS, FEEDBACK CONTROL, TURBOFAN ENGINES

**N90-17639\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**LONGITUDINAL STABILITY AND CONTROL CHARACTERISTICS OF THE QUIET SHORT-HAUL RESEARCH AIRCRAFT (QSRA)**  
JACK D. STEPHENSON and GORDON H. HARDY Washington Dec. 1989 43 p  
(NASA-TP-2965; A-89133; NAS 1.60:2965) Avail: NTIS HC A03/MF A01 CSCL 01C  
AIRCRAFT PERFORMANCE, FLIGHT CHARACTERISTICS, FLIGHT TESTS, LONGITUDINAL CONTROL, LONGITUDINAL STABILITY, RESEARCH AIRCRAFT, SHORT HAUL AIRCRAFT

**N90-19239\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**LOW-SPEED WIND-TUNNEL INVESTIGATION OF THE FLIGHT DYNAMIC CHARACTERISTICS OF AN ADVANCED TURBOPROP BUSINESS/COMMUTER AIRCRAFT CONFIGURATION**  
PAUL L. COE, JR., STEVEN G. TURNER, and D. BRUCE OWENS Washington Apr. 1990 50 p

## 09 RESEARCH AND SUPPORT FACILITIES (AIR)

(NASA-TP-2982; L-16664; NAS 1.60:2982) Avail: NTIS HC A03/MF A01 CSCL 01C  
AERODYNAMIC CHARACTERISTICS, COMMUTER AIRCRAFT, DYNAMIC CHARACTERISTICS, FLIGHT CHARACTERISTICS, FLIGHT TESTS, TURBOPROP AIRCRAFT, WIND TUNNEL TESTS

### 09

#### RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

**N87-10876\*#** National Aeronautics and Space Administration, Washington, DC.

##### AERONAUTICAL FACILITIES ASSESSMENT

F. E. PENARANDA, comp. Nov. 1985 204 p  
(NASA-RP-1146; NAS 1.61:1146) Avail: NTIS HC A10/MF A02 CSCL 14B

A survey of the free world's aeronautical facilities was undertaken and an evaluation made on where the relative strengths and weaknesses exist. Special emphasis is given to NASA's own capabilities and needs. The types of facilities surveyed are: Wind Tunnels; Airbreathing Propulsion Facilities; and Flight Simulators

Author

**N87-17717\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

##### EXPERIMENTAL EVALUATION OF WALL MACH NUMBER DISTRIBUTIONS OF THE OCTAGONAL TEST SECTION PROPOSED FOR NASA LEWIS RESEARCH CENTER'S ALTITUDE WIND TUNNEL

DOUGLAS E. HARRINGTON, RICHARD R. BURLEY, and ROBERT R. CORBAN Nov. 1986 35 p

(NASA-TP-2666; E-3145; NAS 1.60:2666) Avail: NTIS HC A03/MF A01 CSCL 14B

FLOW VELOCITY, MACH NUMBER, WIND TUNNEL APPARATUS, WIND TUNNEL WALLS

**N87-18576\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

##### EXPERIMENTAL EVALUATION OF TWO TURNING VANE DESIGNS FOR FAN DRIVE CORNER OF 0.1-SCALE MODEL OF NASA LEWIS RESEARCH CENTER'S PROPOSED ALTITUDE WIND TUNNEL

DONALD R. BOLDMAN, ROYCE D. MOORE, and RICKEY J. SHYNE Mar. 1987 148 p

(NASA-TP-2646; E-3175; NAS 1.60:2646) Avail: NTIS HC A07/MF A01 CSCL 14B

CORNER FLOW, VANES, WIND TUNNEL APPARATUS, WIND TUNNEL DRIVES

**N87-20295\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

##### DETAILED FLOW SURVEYS OF TURNING VANES DESIGNED FOR A 0.1-SCALE MODEL OF NASA LEWIS RESEARCH CENTER'S PROPOSED ALTITUDE WIND TUNNEL

ROYCE D. MOORE, RICKEY J. SHYNE, DONALD R. BOLDMAN, and THOMAS F. GELDER Apr. 1987 151 p

(NASA-TP-2680; E-3294; NAS 1.60:2680) Avail: NTIS HC A08/MF A01 CSCL 14B

ALTITUDE SIMULATION, FLOW DISTRIBUTION, GUIDE VANES, WIND TUNNEL APPARATUS, WIND TUNNEL DRIVES

**N87-22694\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

##### EXPERIMENTAL EVALUATION OF BLOCKAGE RATIO AND PLENUM EVACUATION SYSTEM FLOW EFFECTS ON PRESSURE DISTRIBUTION FOR BODIES OF REVOLUTION IN 0.1 SCALE MODEL TEST SECTION OF NASA LEWIS RESEARCH CENTER'S PROPOSED ALTITUDE WIND TUNNEL

RICHARD R. BURLEY and DOUGLAS E. HARRINGTON Apr. 1987 26 p

(NASA-TP-2702; E-3267; NAS 1.60:2702) Avail: NTIS HC A03/MF A01 CSCL 14B

EVACUATING (VACUUM), EVALUATION, PLENUM CHAMBERS, WIND TUNNEL MODELS, WIND TUNNEL TESTS

**N87-23662\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

##### EXPERIMENTAL EVALUATION OF HONEYCOMB/SCREEN CONFIGURATIONS AND SHORT CONTRACTION SECTION FOR NASA LEWIS RESEARCH CENTER'S ALTITUDE WIND TUNNEL

RICHARD R. BURLEY and DOUGLAS E. HARRINGTON May 1987 30 p

(NASA-TP-2692; E-3142; NAS 1.60:2692) Avail: NTIS HC A03/MF A01 CSCL 14B

HONEYCOMB STRUCTURES, PRESSURE DISTRIBUTION, SCREENS, TURBULENCE EFFECTS, TURBULENT FLOW, WIND TUNNEL CALIBRATION

**N87-28570\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

##### EVOLUTION, CALIBRATION, AND OPERATIONAL CHARACTERISTICS OF THE TWO-DIMENSIONAL TEST SECTION OF THE LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL

CHARLES L. LADSON and EDWARD J. RAY Sep. 1987 171 p

(NASA-TP-2749; L-16190; NAS 1.60:2749) Avail: NTIS HC A08/MF A01 CSCL 14B

CRYOGENIC WIND TUNNELS, EVOLUTION (DEVELOPMENT), HISTORIES, TRANSONIC WIND TUNNELS, TWO DIMENSIONAL FLOW

**N87-29544\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

##### LANGLEY AIRCRAFT LANDING DYNAMICS FACILITY

PAMELA A. DAVIS, SANDY M. STUBBS, and JOHN A. TANNER Oct. 1987 35 p

(NASA-RP-1189; L-16293; NAS 1.61:1189) Avail: NTIS HC A03/MF A01 CSCL 14B

The Langley Research Center has recently upgraded the Landing Loads Track (LLT) to improve the capability of low-cost testing of conventional and advanced landing gear systems. The unique feature of the Langley Aircraft Landing Dynamics Facility (ALDF) is the ability to test aircraft landing gear systems on actual runway surfaces at operational ground speeds and loading conditions. A historical overview of the original LLT is given, followed by a detailed description of the new ALDF systems and operational capabilities.

Author

**N88-17686\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

##### EXPERIMENTAL EVALUATION OF TURNING VANE DESIGNS FOR HIGH-SPEED AND COUPLED FAN-DRIVE CORNERS OF 0.1-SCALE MODEL OF NASA LEWIS RESEARCH CENTER'S PROPOSED ALTITUDE WIND TUNNEL

THOMAS F. GELDER, ROYCE D. MOORE, RICKEY J. SHYNE, and DONALD R. BOLDMAN May 1987 54 p Microfiche available as supplement

(NASA-TP-2681; E-3218; NAS 1.60:2681) Avail: NTIS HC A04/MF A01 CSCL 14B

ALTITUDE SIMULATION, CORNER FLOW, COUPLING, GUIDE VANES, HIGH SPEED, WIND TUNNEL APPARATUS, WIND TUNNEL DRIVES

## 09 RESEARCH AND SUPPORT FACILITIES (AIR)

**N88-28075\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**FINITE-RATE WATER CONDENSATION IN COMBUSTION-HEATED WIND TUNNELS**  
WAYNE D. ERICKSON, GERALD H. MALL, and RAMADAS K. PRABHU (PRC Systems Services Co., Hampton, Va.) Sep. 1988 76 p  
(NASA-TP-2833; L-16443; NAS 1.60:2833) Avail: NTIS HC A05/MF A01 CSCL 14B  
COMBUSTION PRODUCTS, COMBUSTION WIND TUNNELS, CONDENSING, HIGH TEMPERATURE ENVIRONMENTS, NUCLEATION, WATER

**N90-17647\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**CAST-10-2/DOA 2 AIRFOIL STUDIES WORKSHOP RESULTS**  
EDWARD J. RAY, comp. and ACQUILLA S. HILL, comp. Washington Nov. 1989 259 p Workshop held in Hampton, VA, 23-27 Sep. 1988  
(NASA-CP-3052; L-16633; NAS 1.55:3052) Avail: NTIS HC A12/MF A02 CSCL 14B  
AERODYNAMIC CHARACTERISTICS, AERODYNAMIC INTERFERENCE, AIRFOIL PROFILES, AIRFOILS, CONFERENCES, FLOW DISTRIBUTION, REYNOLDS NUMBER, WIND TUNNEL TESTS

**N90-19242\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**COMPARISON BETWEEN DESIGN AND INSTALLED ACOUSTIC CHARACTERISTICS OF NASA LEWIS 9- BY 15-FOOT LOW-SPEED WIND TUNNEL ACOUSTIC TREATMENT**  
MILO D. DAHL and RICHARD P. WOODWARD Washington Apr. 1990 28 p Presented at the 115th Meeting of the Acoustical Society of America, Seattle, WA, 16-20 May 1988  
(NASA-TP-2996; E-4981; NAS 1.60:2996) Avail: NTIS HC A03/MF A01 CSCL 14B  
ACOUSTIC ATTENUATION, ACOUSTIC MEASUREMENT, AIRCRAFT NOISE, LOW SPEED WIND TUNNELS, PANELS, PERFORATED PLATES

## 12

### ASTRONAUTICS (GENERAL)

**N78-76855\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**FLIGHT MECHANICS/ESTIMATION THEORY SYMPOSIUM**  
A. FUCHS 1975 265 p refs Symp. held at Greenbelt, Md., 29-30 1975  
(NASA-CP-2002) Avail: Goddard Space Flight Center, Code 582  
CONFERENCES, FLIGHT MECHANICS, ORBIT CALCULATION, ORBITAL POSITION ESTIMATION

**N87-20302\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**THE 1986 GET AWAY SPECIAL EXPERIMENTER'S SYMPOSIUM**  
LAWRENCE R. THOMAS, ed. and FRANCES L. MOSIER, ed. Feb. 1987 236 p Symposium held in Greenbelt, Md., 7-8 Oct. 1986  
(NASA-CP-2438; NAS 1.55:2438) Avail: NTIS HC A11/MF A02 CSCL 22A  
CONFERENCES, GET AWAY SPECIALS (STS), GOVERNMENT/INDUSTRY RELATIONS, SPACE SHUTTLE PAYLOADS, UNIVERSITIES

**N87-29576\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**TECHNOLOGY FOR LARGE SPACE SYSTEMS: A BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 17)**  
Oct. 1987 140 p  
(NASA-SP-7046(17); NAS 1.21:7046(17)) Avail: NTIS HC A07 CSCL 22B

This bibliography lists 512 reports, articles, and other documents introduced into the NASA scientific and technical information system between January 1, 1987 and June 30, 1987. Its purpose is to provide helpful information to the researcher, manager, and designer in technology development and mission design according to system, interactive analysis and design, structural and thermal analysis and design, structural concepts and control systems, electronics, advanced materials, assembly concepts, propulsion, and solar power satellite systems. Author

**N88-17691\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**THE 1987 GET AWAY SPECIAL EXPERIMENTER'S SYMPOSIUM**  
NEAL BARTHELME, ed. and FRANCES L. MOSIER, ed. (RMS Technologies, Inc., Landover, Md.) Feb. 1988 169 p Symposium held in Greenbelt, Md., 27-28 Oct. 1987  
(NASA-CP-2500; REPT-88B0049; NAS 1.55:2500) Avail: NTIS HC A08/MF A01 CSCL 22A  
GET AWAY SPECIALS (STS), MISSION PLANNING, PROJECT PLANNING, SPACE SHUTTLE MISSIONS, SPACE STATIONS

**N88-27214\*#** National Aeronautics and Space Administration. Washington, DC.  
**TECHNOLOGY FOR LARGE SPACE SYSTEMS: A BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 18)**  
Jun. 1988 162 p  
(NASA-SP-7046(18); NAS 1.21:7046(18)) Avail: NTIS HC A08 CSCL 22B

This bibliography lists 569 reports, articles, and other documents introduced into the NASA scientific and technical information system between July 1, 1987 and December 31, 1987. Its purpose is to provide helpful information to the researcher, manager, and designer in technology development and mission design according to system, interactive analysis and design, structural and thermal analysis and design, structural concepts and control systems, electronics, advanced materials, assembly concepts, propulsion, and solar power satellite systems. Author

**N89-10902\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**THE 1988 GET AWAY SPECIAL EXPERIMENTER'S SYMPOSIUM**  
LAWRENCE R. THOMAS, ed. and FRANCES L. MOSIER, ed. (RMS Technologies, Inc., Landover, Md.) Sep. 1988 127 p Symposium held in Cocoa Beach, Fla., 27-30 Sep. 1988 Sponsored by NASA, Washington  
(NASA-CP-3008; REPT-88-158; NAS 1.55:3008) Avail: NTIS HC A07/MF A01 CSCL 22A  
CONFERENCES, GET AWAY SPECIALS (STS), SPACE SHUTTLE PAYLOADS, SPACEBORNE EXPERIMENTS

**N89-11760\*#** National Aeronautics and Space Administration. Washington, DC.  
**TECHNOLOGY FOR FUTURE NASA MISSIONS: CIVIL SPACE TECHNOLOGY INITIATIVE (CSTI) AND PATHFINDER**  
Sep. 1988 550 p Conference held in Washington, D.C., 12-13 Sep. 1988; sponsored in part by NASA and AIAA  
(NASA-CP-3016; NAS 1.55:3016) Avail: NTIS HC A23/MF A03 CSCL 22A  
AEROASSIST, CONFERENCES, NASA PROGRAMS, ORBIT TRANSFER VEHICLES, SPACEBORNE EXPERIMENTS, SPACECRAFT CONSTRUCTION MATERIALS, SPACECRAFT INSTRUMENTS, SPACECRAFT POWER SUPPLIES, SPACECRAFT PROPULSION

## 15 LAUNCH VEHICLES AND SPACE VEHICLES

13

### ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

**N88-15820\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### **A STUDY TO EVALUATE STS HEADS-UP ASCENT TRAJECTORY PERFORMANCE EMPLOYING A MINIMUM-HAMILTONIAN OPTIMIZATION STRATEGY**

SUJIT SINHA Feb. 1988 56 p  
(NASA-TP-2793; M-580; NAS 1.60:2793) Avail: NTIS HC A04/MF A01 CSCL 22A

ASCENT TRAJECTORIES, EVALUATION, HAMILTONIAN FUNCTIONS, OPTIMIZATION, SPACE TRANSPORTATION SYSTEM

**N89-15934\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

#### **FLIGHT MECHANICS/ESTIMATION THEORY SYMPOSIUM 1988**

THOMAS STENGLE, ed. Washington, DC Sep. 1988 611 p  
Symposium held in Greenbelt, MD, 10-11 May 1988  
(NASA-CP-3011; REPT-88B0224; NAS 1.55:3011) Avail: NTIS HC A99/MF A04 CSCL 22A

ESTIMATES, FLIGHT MECHANICS, ORBITAL MECHANICS, SPACECRAFT PERFORMANCE

**N90-13413\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

#### **FLIGHT MECHANICS/ESTIMATION THEORY SYMPOSIUM, 1989**

THOMAS STENGLE, ed. Washington Oct. 1989 466 p  
Symposium held in Greenbelt, MD, 23-24 May 1989  
(NASA-CP-3050; REPT-89B00261; NAS 1.55:3050) Avail: NTIS HC A20/MF A03 CSCL 22A

CONFERENCES, FLIGHT MECHANICS, ORBITAL MECHANICS, SATELLITE ATTITUDE CONTROL

**N90-13444\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### **A TRANSIENT RESPONSE METHOD FOR LINEAR COUPLED SUBSTRUCTURES**

J. R. ADMIRE and J. A. BRUNTY Dec. 1989 26 p  
(NASA-TP-2926; NAS 1.60:2926) Avail: NTIS HC A03/MF A01 CSCL 22A

DISCRETE FUNCTIONS, LINEAR SYSTEMS, LOADS (FORCES), MATHEMATICAL MODELS, NUMERICAL INTEGRATION, TRANSIENT RESPONSE

**N90-26028\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### **FORBIDDEN TANGENTIAL ORBIT TRANSFERS BETWEEN INTERSECTING KEPLERIAN ORBITS**

ROWLAND E. BURNS Jul. 1990 53 p  
(NASA-TP-3031; NAS 1.60:3031) Avail: NTIS HC A04/MF A01 CSCL 22A

KEPLER LAWS, PLANAR STRUCTURES, TRANSFER ORBITS, TWO BODY PROBLEM

14

### GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

**N89-28545\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

#### **DIGITALLY MODULATED BIT ERROR RATE MEASUREMENT SYSTEM FOR MICROWAVE COMPONENT EVALUATION**

MARY JO W. SHALKHAUSER and JAMES M. BUDINGER Washington Jul. 1989 20 p  
(NASA-TP-2912; E-4456; NAS 1.60:2912) Avail: NTIS HC A03/MF A01 CSCL 14B

BIT ERROR RATE, COMMUNICATION SATELLITES, DATA TRANSMISSION, DIGITAL DATA, MICROWAVE EQUIPMENT, MODULATION, TIME DIVISION MULTIPLE ACCESS

15

### LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles.

**N87-12581\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### **SOLAR ARRAY FLIGHT DYNAMIC EXPERIMENT**

R. W. SCHOCK Washington May 1986 27 p  
(NASA-TP-2598; NAS 1.60:2598) Avail: NTIS HC A03/MF A01 CSCL 10A

LARGE SPACE STRUCTURES, LASER APPLICATIONS, SOLAR ARRAYS, SPACE SHUTTLE PAYLOADS, TRACKING (POSITION)

**N87-18588\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### **SYSTEM STUDY OF THE CARBON DIOXIDE OBSERVATIONAL PLATFORM SYSTEM (CO-OPS): PROJECT OVERVIEW**

J. BRISCOE STEPHENS and WILBUR E. THOMPSON Mar. 1987 35 p  
(NASA-TP-2696; NAS 1.60:2696) Avail: NTIS HC A03/MF A01 CSCL 22B

ATMOSPHERIC COMPOSITION, CARBON DIOXIDE, REMOTE SENSING, SPACE PLATFORMS

**N87-22702\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### **STRUCTURAL DYNAMICS AND CONTROL INTERACTION OF FLEXIBLE STRUCTURES**

ROBERT S. RYAN, ed. and HAROLD N. SCOFIELD, ed. Apr. 1987 680 p Workshop held in Huntsville, AL., 22-24 Apr. 1986

(NASA-CP-2467-PT-1; M-554-PT-1; NAS 1.55:2467-PT-1) Avail: NTIS HC A99/MF A04 CSCL 22B

CONTROL SYSTEMS DESIGN, DYNAMIC STRUCTURAL ANALYSIS, FLEXIBLE BODIES, LARGE SPACE STRUCTURES, SPACECRAFT CONTROL

**N87-22729\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### **STRUCTURAL DYNAMICS AND CONTROL INTERACTION OF FLEXIBLE STRUCTURES**

ROBERT S. RYAN, ed. and HAROLD N. SCOFIELD, ed. Apr.

## 15 LAUNCH VEHICLES AND SPACE VEHICLES

1987 729 p Workshop held in Huntsville, Ala., 22-24 Apr. 1986

(NASA-CP-2467-PT-2; M-554-PT-2; NAS 1.55:2467-PT-2) Avail: NTIS HC A99/MF A04 CSCL 22B

CONFERENCES, DESIGN ANALYSIS, DYNAMIC STRUCTURAL ANALYSIS, FLEXIBLE BODIES, JOINTS (JUNCTIONS), LARGE SPACE STRUCTURES, SPACE STATIONS

**N88-14112\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**HYDROBURST TEST OF A CARBON-CARBON INVOLUTE EXIT CONE**

ROY M. SULLIVAN Jan. 1986 33 p (NASA-TP-2556; NAS 1.60:2556) Avail: NTIS HC A03/MF A01 CSCL 20H

BURST TESTS, CARBON-CARBON COMPOSITES, CONES, EXHAUST NOZZLES, HYDRODYNAMICS

**N89-18504\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**PRACTICES IN ADEQUATE STRUCTURAL DESIGN**

ROBERT S. RYAN Jan. 1989 98 p (NASA-TP-2893; NAS 1.60:2893) Avail: NTIS HC A05/MF A01 CSCL 22B

FLIGHT SAFETY, MANAGEMENT METHODS, PROJECT MANAGEMENT, REQUIREMENTS, SPACE SHUTTLES, STRESS ANALYSIS, STRUCTURAL DESIGN

**N90-14256\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**PAYLOAD CREW UTILIZATION FOR SPACELAB MISSIONS**

K. Y. IBRAHIM and J. D. WEILER Jan. 1990 55 p (NASA-TP-2976; NAS 1.60:2976) Avail: NTIS HC A04/MF A01 CSCL 22A

CREW PROCEDURES (INFLIGHT), PAYLOAD INTEGRATION, SCHEDULING, SPACECREWS, TASK COMPLEXITY

**N90-19249\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EARTH SCIENCE GEOSTATIONARY PLATFORM TECHNOLOGY**

ROBERT L. WRIGHT, ed. and THOMAS G. CAMPBELL, ed. Washington Jul. 1989 386 p Workshop held in Hampton, VA, 21-22 Sep. 1988 (NASA-CP-3040; L-16612; NAS 1.55:3040) Avail: NTIS HC A17/MF A03 CSCL 22B

ANTENNA DESIGN, CONFERENCES, ELECTROMAGNETISM, LARGE SPACE STRUCTURES, METROLOGY, MICROWAVE SENSORS, REMOTE SENSING, SYNCHRONOUS PLATFORMS

## 16

### SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.

**N87-12585\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**DEVELOPMENT TESTING OF LARGE VOLUME WATER SPRAYS FOR WARM FOG DISPERSAL**

V. W. KELLER, B. J. ANDERSON, R. A. BURNS, G. G. LALA (New York State Univ., Albany), M. B. MEYER, and K. V. BEARD (Illinois Univ., Urbana-Champaign) Washington Jun. 1986 112 p (NASA-TP-2607; NAS 1.60:2607) Avail: NTIS HC A06/MF A01 CSCL 14B

COALESCING, FOG DISPERSAL, SPACE SHUTTLES, SPACECRAFT LAUNCHING, SPRAY NOZZLES, WATER

**N88-12520\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**SPACECRAFT FIRE SAFETY**

JANICE M. MARGLE, ed. (Pennsylvania State Univ., Abington.) 1987 134 p Workshop held in Cleveland, Ohio, 20-21 Aug. 1986

(NASA-CP-2476; E-3464; NAS 1.55:2476) Avail: NTIS HC A07/MF A01 CSCL 22B

ATMOSPHERIC COMPOSITION, COMBUSTION PHYSICS, CONFERENCES, FIRE EXTINGUISHERS, FIRES, FLAMMABILITY, INERT ATMOSPHERE, SPACE STATIONS, SPACECRAFT ENVIRONMENTS

**N90-25160\*#** National Aeronautics and Space Administration. Washington, DC.

**SPACE SHUTTLE AVIONICS SYSTEM**

JOHN F. HANAWAY (Intermetrics, Inc., Houston, TX.) and ROBERT W. MOOREHEAD 1989 75 p Original contains color illustrations (NAS9-17826)

(NASA-SP-504; S-579; NAS 1.21:504; LC-89-600316) Avail: NTIS HC A04/MF A01; also available SOD HC \$8.50 as 033-000-01079-6; 5 functional color pages CSCL 22B

The Space Shuttle avionics system, which was conceived in the early 1970's and became operational in the 1980's represents a significant advancement of avionics system technology in the areas of systems and redundancy management, digital data base technology, flight software, flight control integration, digital fly-by-wire technology, crew display interface, and operational concepts. The origins and the evolution of the system are traced; the requirements, the constraints, and other factors which led to the final configuration are outlined; and the functional operation of the system is described. An overall system block diagram is included. Author

**N90-26036\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**THE EFFECT OF INTERPLANETARY TRAJECTORY OPTIONS ON A MANNED MARS AEROBRAKE CONFIGURATION**

ROBERT D. BRAUN, RICHARD W. POWELL, and LIN C. HARTUNG Washington Aug. 1990 79 p (NASA-TP-3019; L-16661; NAS 1.60:3019) Avail: NTIS HC A05/MF A01 CSCL 22B

AEROBRAKING, ATMOSPHERIC ENTRY SIMULATION, INTERPLANETARY NAVIGATION, INTERPLANETARY TRAJECTORIES, MANNED MARS MISSIONS, PROPULSION SYSTEM PERFORMANCE, TRAJECTORY OPTIMIZATION

## 18

### SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

**N87-16014\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**NASA/DOD CONTROL/STRUCTURES INTERACTION TECHNOLOGY, 1986**

ROBERT L. WRIGHT, comp. Nov. 1986 549 p Conference held in Norfolk, Va., 18-21 Nov. 1986; sponsored by NASA Langley Research Center and AFWAL (NASA-CP-2447-PT-1; L-16242-PT-1; NAS 1.55:2447-PT-1) Avail: NTIS HC A23/MF A04 CSCL 22B

ANTENNAS, CONFERENCES, FLEXIBLE SPACECRAFT, LARGE SPACE STRUCTURES, SPACE STATIONS, SPACECRAFT CONTROL, SPACECRAFT DESIGN, SYSTEMS ENGINEERING, TRUSSES, VIBRATION DAMPING

**N87-24495\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**NASA/DOD CONTROL/STRUCTURES INTERACTION TECHNOLOGY, 1986**

ROBERT L. WRIGHT, comp. Jun. 1987 314 p Conference held in Norfolk, Va., 18-21 Nov. 1986

(NASA-CP-2447-PT-2; L-16242-PT-2; NAS 1.55:2447-PT-2)

Avail: NTIS HC A14/MF A02 CSCL 22B

CONTROL STABILITY, CONTROL SYSTEMS DESIGN, INTERACTIVE CONTROL, SPACE STATIONS, SPACECRAFT CONTROL, VIBRATION DAMPING

**N87-26073\*** National Aeronautics and Space Administration, Washington, DC.

**SPACE STATION SYSTEMS: A BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 4)**

May 1987 220 p

(NASA-SP-7056(04); NAS 1.21:7056(04)) Avail: NTIS HC A10

CSCL 22B

This bibliography lists 832 reports, articles, and other documents introduced into the NASA scientific and technical information system between July 1, 1986 and December 31, 1986. Its purpose is to provide helpful information to the researcher, manager, and designer in technology development and mission design according to system, interactive analysis and design, structural and thermal analysis and design, structural concepts and control systems, electronics, advanced materials, assembly concepts, propulsion, and solar power satellite systems. The coverage includes documents that define major systems and subsystems, servicing and support requirements, procedures and operations, and missions for the current and future space station. Author

**N88-10084\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**SPACECRAFT 2000**

Jul. 1986 236 p Workshop held in Cleveland, Ohio, 29-31 Jul. 1986

(NASA-CP-2473; E-3358; NAS 1.55:2473) Avail: NTIS HC

A11/MF A02 CSCL 22B

CONFERENCES, SPACE STATIONS, SPACECRAFT ELECTRONIC EQUIPMENT, SPACECRAFT PROPULSION, SPACECRAFT TRACKING, SYSTEMS ANALYSIS, TELEMETRY

**N88-10829\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

**FOURTEENTH SPACE SIMULATION CONFERENCE: TESTING FOR A PERMANENT PRESENCE IN SPACE**

JOSEPH L. STECHER, III, ed. 1986 435 p Conference held in Baltimore, Md., 3-6 Nov. 1986; sponsored by NASA, Inst. of Environmental Sciences, AIAA, and the American Society for Testing and Materials

(NASA-CP-2446; REPT-86B0561; NAS 1.55:2446) Avail: NTIS

HC A19/MF A03 CSCL 22B

CLEANING, CONFERENCES, SIMULATION, SPACE SHUTTLES, SPACE STATIONS, SPACECRAFT CONTAMINATION, SPACECRAFT ENVIRONMENTS, TEST FACILITIES, THERMAL ENVIRONMENTS

**N88-10870\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**SPACE CONSTRUCTION**

JANE A. HAGAMAN, ed. Oct. 1987 308 p Conference held in Hampton, Va., 6-7 Aug. 1986

(NASA-CP-2490; L-16378; NAS 1.55:2490) Avail: NTIS HC

A14/MF A02 CSCL 22B

CONFERENCES, EXTRAVEHICULAR ACTIVITY, MANAGEMENT PLANNING, MISSION PLANNING, SPACE SHUTTLE PAYLOADS, SPACE STATIONS, SPACE TRANSPORTATION SYSTEM

**N88-13382\*** National Aeronautics and Space Administration, Washington, DC.

**SPACE STATION SYSTEMS: A BIBLIOGRAPHY WITH INDEXES**

Nov. 1987 245 p

(NASA-SP-7056(05); NAS 1.21:7056(05)) Avail: NTIS HC A11

CSCL 22B

This bibliography lists 967 reports, articles, and other documents introduced into the NASA scientific and technical information system between January 1, 1987 and June 30, 1987. Its purpose is to provide helpful information to the researcher, manager, and designer in technology development and mission design according to system, interactive analysis and design, structural and thermal analysis and design, structural concepts and control systems, electronics, advanced materials, assembly concepts, propulsion, and solar power satellite systems. The coverage includes documents that define major systems and subsystems, servicing and support requirements, procedures and operations, and missions for the current and future space station. Author

**N88-14115\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**CONTINUUM MODELING OF LARGE LATTICE STRUCTURES: STATUS AND PROJECTIONS**

AHMED K. NOOR and MARTIN M. MIKULAS, JR. Feb. 1988 79 p

(NASA-TP-2767; L-16360; NAS 1.60:2767) Avail: NTIS HC

A05/MF A01 CSCL 22B

CONTINUUM MODELING, LATTICES, STRUCTURAL ANALYSIS, TRUSSES

**N89-12580\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**LIGHTWEIGHT STRUCTURAL DESIGN OF A BOLTED CASE JOINT FOR THE SPACE SHUTTLE SOLID ROCKET MOTOR**

JOHN T. DORSEY, PETER A. STEIN (Coast Guard, Yorktown, Va.), and HAROLD G. BUSH Washington, D.C. Nov. 1988 24 p

(NASA-TP-2851; L-16496; NAS 1.60:2851) Avail: NTIS HC

A03/MF A01 CSCL 22B

BOLTED JOINTS, ROCKET ENGINE CASES, SPACE SHUTTLE MAIN ENGINE, STRUCTURAL ANALYSIS

**N89-12582\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

**FIFTEENTH SPACE SIMULATION CONFERENCE: SUPPORT THE HIGHWAY TO SPACE THROUGH TESTING**

JOSEPH STECHER, ed. 1988 492 p Conference held in Williamsburg, Va., 31 Oct. - 3 Nov. 1988; sponsored by NASA, Inst. of Environmental Sciences, AIAA, and the American Society for Testing and Materials

(NASA-CP-3015; REPT-88B0253; NAS 1.55:3015) Avail: NTIS

HC A21/MF A03 CSCL 22B

COMMUNICATION SATELLITES, CONFERENCES, HEAT TRANSFER, RADIATION DAMAGE, SOLAR SIMULATORS, SPACE ENVIRONMENT SIMULATION, SPACE SIMULATORS, SPACE STATIONS, SPACECRAFT CONTAMINATION, THERMAL CONTROL COATINGS

**N89-18522\*** National Aeronautics and Space Administration, Washington, DC.

**SPACE STATION SYSTEMS: A BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 7)**

Dec. 1988 289 p

(NASA-SP-7056(07); NAS 1.21:7056(07)) Avail: NTIS HC A13

CSCL 22B

This bibliography lists 1,158 reports, articles, and other documents introduced into the NASA scientific and technical information system between January 1, 1988 and June 30, 1988. Its purpose is to provide helpful information to researchers, designers and managers engaged in Space Station technology development and mission design. Coverage includes documents that define major systems and subsystems related to structures

## 18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

and dynamic control, electronics and power supplies, propulsion, and payload integration. In addition, orbital construction methods, servicing and support requirements, procedures and operations, and missions for the current and future Space Station are included. Author

**N89-26037\*** National Aeronautics and Space Administration, Washington, DC.

### **TECHNOLOGY FOR LARGE SPACE SYSTEMS: A BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 20)**

Jun. 1989 183 p  
(NASA-SP-7046(20); NAS 1.21:7046(20)) Avail: NTIS HC A09 CSCL 22B

This bibliography lists 694 reports, articles, and other documents introduced into the NASA Scientific and Technical Information System between July, 1988 and December, 1988. Its purpose is to provide helpful information to the researcher or manager engaged in the development of technologies related to large space systems. Subject areas include mission and program definition, design techniques, structural and thermal analysis, structural dynamics and control systems, electronics, advanced materials, assembly concepts, and propulsion. Author

**N90-21062\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

### **NASA/DOD CONTROLS-STRUCTURES INTERACTION TECHNOLOGY 1989**

JERRY R. NEWSOM, comp. Washington Aug. 1989 543 p  
Conference held in San Diego, CA, 29 Jan. - 2 Feb. 1989; sponsored by NASA Langley Research Center, Hampton, VA and Wright Research Development Center, Wright-Patterson AFB, OH (NASA-CP-3041; L-16602; NAS 1.55:3041) Avail: NTIS HC A23/MF A03 CSCL 22B

CONFERENCES, CONTROL SYSTEMS DESIGN, FLEXIBLE BODIES, GROUND TESTS, LARGE SPACE STRUCTURES, MATHEMATICAL MODELS, STRUCTURAL DESIGN, SYSTEMS ENGINEERING

**N90-25171\*** National Aeronautics and Space Administration, Washington, DC.

### **SPACE STATION SYSTEMS: A BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 10)**

Jun. 1990 352 p  
(NASA-SP-7056(10); NAS 1.21:7056(10)) Avail: NTIS HC A16 CSCL 22B

This bibliography lists 1,422 reports, articles, and other documents introduced into the NASA scientific and technical information system between July 1, 1989 and December 31, 1989. Its purpose is to provide helpful information to researchers, designers and managers engaged in Space Station technology development and mission design. Coverage includes documents that define major systems and subsystems related to structures and dynamic control, electronics and power supplies, propulsion, and payload integration. In addition, orbital construction methods, servicing and support requirements, procedures and operations, and missions for the current and future Space Station are included. Author

**N90-26056\*** National Aeronautics and Space Administration, Washington, DC.

### **TECHNOLOGY FOR LARGE SPACE SYSTEMS: A BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 22)**

Jul. 1990 274 p  
(NASA-SP-7046(22); NAS 1.21:7046(22)) Avail: NTIS HC A12 CSCL 22B

This bibliography lists 1077 reports, articles, and other documents introduced into the NASA Scientific and Technical Information System between July 1, 1989 and December 31, 1989. Its purpose is to provide helpful information to the researcher or manager engaged in the development of technologies related to large space systems. Subject areas include mission and program definition, design techniques, structural and thermal analysis,

structural dynamics and control systems, electronics, advanced materials, assembly concepts, and propulsion. Author

**N90-27738\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

### **THERMAL-DISTORTION ANALYSIS OF AN ANTENNA STRONGBACK FOR GEOSTATIONARY HIGH-FREQUENCY MICROWAVE APPLICATIONS**

JEFFREY T. FARMER, DEBORAH M. WAHLS, and ROBERT L. WRIGHT Washington Sep. 1990 22 p  
(NASA-TP-3016; L-16739; NAS 1.60:3016) Avail: NTIS HC A03/MF A01 CSCL 22A

ANTENNA DESIGN, GEOSYNCHRONOUS ORBITS, MICROWAVE ANTENNAS, MICROWAVE SOUNDING, STRUCTURAL ANALYSIS, SYNCHRONOUS PLATFORMS, THERMAL ENVIRONMENTS

## 20

## SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

**N87-20380\*#** National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

### **SOLAR ARRAY FLIGHT EXPERIMENT/DYNAMIC AUGMENTATION EXPERIMENT**

LEIGHTON E. YOUNG and HOMER C. PACK, JR. Feb. 1987 72 p  
(NASA-TP-2690; NAS 1.60:2690) Avail: NTIS HC A04/MF A01 CSCL 10A

LARGE SPACE STRUCTURES, SOLAR ARRAYS, SOLAR DYNAMIC POWER SYSTEMS, SPACE ERECTABLE STRUCTURES, SPACE SHUTTLE PAYLOADS

**N87-20381\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

### **EXPERIMENTAL THRUST PERFORMANCE OF A HIGH-AREA-RATIO ROCKET NOZZLE**

ALBERT J. PAVLI, KENNETH J. KACYNSKI, and TAMARA A. SMITH Apr. 1987 16 p Presented at the 23rd JANNAF Combustion Meeting, Hampton, Va., 20-24 Oct. 1986  
(NASA-TP-2720; E-3236-1; NAS 1.60:2720) Avail: NTIS HC A03/MF A01 CSCL 21H

AREA, NOZZLE GEOMETRY, ROCKET NOZZLES, ROCKET THRUST

**N87-22766\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

### **STRUCTURAL INTEGRITY AND DURABILITY OF REUSABLE SPACE PROPULSION SYSTEMS**

1987 205 p Conference held in Cleveland, Ohio, 12-13 May 1987  
(NASA-CP-2471; E-3512; NAS 1.55:2471) Avail: NTIS HC A10/MF A02 CSCL 21H

AEROTHERMODYNAMICS, CONFERENCES, DURABILITY, DYNAMIC STRUCTURAL ANALYSIS, FATIGUE (MATERIALS), FRACTURE MECHANICS, SPACE SHUTTLE MAIN ENGINE, SPACECRAFT PROPULSION, STRUCTURAL RELIABILITY

**N87-25423\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

### **COMPARISON OF THEORETICAL AND EXPERIMENTAL THRUST PERFORMANCE OF A 1030:1 AREA RATIO ROCKET NOZZLE AT A CHAMBER PRESSURE OF 2413 KN/M<sup>2</sup> (350 PSIA)**

TAMARA A. SMITH, ALBERT J. PAVLI, and KENNETH J. KACYNSKI 1987 25 p Presented at the 23rd Joint Propulsion Conference, San Diego, Calif., 29 Jun. - 2 Jul. 1987; sponsored



## 23 CHEMISTRY AND MATERIALS (GENERAL)

by AIAA, SAE, ASME and ASEE  
(NASA-TP-2725; E-3523; NAS 1.60:2725; AIAA-87-2069) Avail:  
NTIS HC A03/MF A01 CSCL 21H  
ENGINE TESTS, PREDICTIONS, ROCKET NOZZLES, ROCKET  
THRUST

**N87-25424\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.  
**EXPERIMENTAL EVALUATION OF HEAT TRANSFER ON A  
1030:1 AREA RATIO ROCKET NOZZLE**  
KENNETH J. KACYNSKI, ALBERT J. PAVLI, and TAMARA A.  
SMITH Aug. 1987 28 p Presented at the 23rd Joint Propulsion  
Conference, San Diego, Calif., 29 Jun. - 2 Jul. 1987; sponsored  
by AIAA, SAE, ASME and ASEE  
(NASA-TP-2726; E-3558; NAS 1.60:2726; AIAA-87-2070) Avail:  
NTIS HC A03/MF A01 CSCL 21H  
EXHAUST NOZZLES, HEAT FLUX, HEAT TRANSFER,  
NOZZLE FLOW, ROCKET NOZZLES, WALL TEMPERATURE

**N87-25425\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.  
**ANALYSIS OF QUASI-HYBRID SOLID ROCKET BOOSTER  
CONCEPTS FOR ADVANCED EARTH-TO-ORBIT VEHICLES**  
ROBERT L. ZURAWSKI and DOUGLAS C. RAPP (Sverdrup  
Technology, Inc., Cleveland, Ohio.) Aug. 1987 32 p Presented  
at the 23rd Joint Propulsion Conference, San Diego, Calif. 29  
Jun. - 2 Jul. 1987; sponsored by AIAA, SAE, ASME and ASEE  
(NASA-TP-2751; E-3554; NAS 1.60:2751; AIAA-87-2082) Avail:  
NTIS HC A03/MF A01 CSCL 21H  
FEASIBILITY ANALYSIS, HYBRID PROPELLANT ROCKET  
ENGINES, SPACE SHUTTLE BOOSTERS

**N88-12538\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.  
**COMPATIBILITY OF DISPERSION-STRENGTHENED  
PLATINUM WITH RESISTOJET PROPELLANTS**  
MARGARET V. WHALEN and MICHAEL V. NATHAL Oct. 1987  
29 p  
(NASA-TP-2765; E-3738; NAS 1.60:2765) Avail: NTIS HC  
A03/MF A01 CSCL 21H  
COMPATIBILITY, DISPERSING, PLATINUM, PRECIPITATION  
HARDENING, RESISTOJET ENGINES, ROCKET PROPELLANTS

**N89-12626\*#** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, AL.  
**ADVANCED EARTH-TO-ORBIT PROPULSION TECHNOLOGY  
1986, VOLUME 2**  
R. J. RICHMOND, ed. and S. T. WU, ed. (Alabama Univ.,  
Huntsville.) Oct. 1986 775 p Conference held in Huntsville,  
Ala., 13-15 May 1986  
(NASA-CP-2437-VOL-2; M-541-VOL-2; NAS 1.55:2437-VOL-2)  
Avail: NTIS HC A99/MF E06 CSCL 21H  
BEARINGS, BOOSTER ROCKET ENGINES, CONFERENCES,  
FRACTURE MECHANICS, FUEL COMBUSTION, HYDROGEN  
EMBRITTLMENT, HYDROGEN OXYGEN ENGINES, METAL  
FATIGUE, PROPULSION SYSTEM CONFIGURATIONS, ROCKET  
ENGINE DESIGN, SPACE SHUTTLE MAIN ENGINE,  
SPACECRAFT PROPULSION

**N89-15979\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.  
**HIGH-PRESSURE CALORIMETER CHAMBER TESTS FOR  
LIQUID OXYGEN/KEROSENE (LOX/RP-1) ROCKET  
COMBUSTION**  
PHILIP A. MASTERS, ELIZABETH S. ARMSTRONG, and HAROLD  
G. PRICE Dec. 1988 18 p  
(NASA-TP-2862; E-2645; NAS 1.60:2862) Avail: NTIS HC  
A03/MF A01 CSCL 21H  
CALORIMETERS, COMBUSTION CHAMBERS, HIGH  
PRESSURE, KEROSENE, LIQUID OXYGEN, OXYGEN-HYDRO-  
CARBON ROCKET ENGINES, RP-1 ROCKET PROPELLANTS

**N90-10140\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.  
**SECOND BEAMED SPACE-POWER WORKSHOP**  
RUSSELL J. DEYOUNG, ed. Washington Jul. 1989 439 p  
Workshop held in Hampton, VA, 28 Feb. - 2 Mar. 1989  
(NASA-CP-3037; L-16590; NAS 1.55:3037) Avail: NTIS HC  
A19/MF A03 CSCL 10B  
CONFERENCES, ENERGY CONVERSION, LASER POWER  
BEAMING, LASER PROPULSION, LUNAR BASES, MICROWAVE  
POWER BEAMING, SATELLITE POWER TRANSMISSION, SOLAR  
POWER SATELLITES, SPACECRAFT POWER SUPPLIES,  
SPACECRAFT PROPULSION

**N90-21795\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.  
**FREE-SPACE POWER TRANSMISSION**  
Washington Nov. 1989 189 p Workshop held in Cleveland,  
OH, 29-30 Mar. 1988  
(NASA-CP-10016; E-4161; NAS 1.55:10016) Avail: NTIS HC  
A09/MF A02 CSCL 10B  
CONFERENCES, CYCLOTRON RESONANCE DEVICES, FREE  
ELECTRON LASERS, INFLATABLE STRUCTURES, POWER  
TRANSMISSION, SOLAR-PUMPED LASERS

**N90-28611\*#** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, AL.  
**ADVANCED EARTH-TO-ORBIT PROPULSION TECHNOLOGY  
1988, VOLUME 1**  
ROBERT J. RICHMOND, ed. and S. T. WU, ed. (Alabama Univ.,  
Huntsville.) Washington Sep. 1988 775 p Conference held  
in Huntsville, AL, 10-12 May 1988  
(NASA-CP-3012-VOL-1; M-593-VOL-1; NAS 1.55:3012-VOL-1)  
Avail: NTIS HC A99/MF E06 CSCL 21H  
CONFERENCES, LIQUID PROPELLANT ROCKET ENGINES,  
LIQUID ROCKET PROPELLANTS, OXYGEN-HYDROCARBON  
ROCKET ENGINES, PROPULSION SYSTEM PERFORMANCE,  
TRANSFER ORBITS

## 23

## CHEMISTRY AND MATERIALS (GENERAL)

**N87-18011\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.  
**SPECTROSCOPIC COMPARISON OF EFFECTS OF ELECTRON  
RADIATION ON MECHANICAL PROPERTIES OF TWO  
POLYIMIDES**  
EDWARD R. LONG, JR. and SHEILA ANN T. LONG Apr. 1987  
21 p  
(NASA-TP-2663; L-16200; NAS 1.60:2663) Avail: NTIS HC  
A03/MF A01 CSCL 11C  
DURABILITY, ELECTRON RADIATION, KAPTON  
(TRADEMARK), RADIATION DAMAGE, TENSILE PROPERTIES

**N88-12543\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.  
**SURFACE CATALYTIC DEGRADATION STUDY OF TWO  
LINEAR PERFLUOROPOLYALKYLETHERS AT 345 C**  
WILFREDO MORALES Nov. 1987 12 p  
(NASA-TP-2774; E-3395; NAS 1.60:2774) Avail: NTIS HC  
A03/MF A01 CSCL 07A  
ALKYL COMPOUNDS, CATALYSIS, DEGRADATION, ETHERS,  
PERFLUORO COMPOUNDS, SURFACE REACTIONS

**N89-23528\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.  
**NASA/SDIO SPACE ENVIRONMENTAL EFFECTS ON  
MATERIALS WORKSHOP, PART 1**

## 23 CHEMISTRY AND MATERIALS (GENERAL)

LOUIS A. TEICHMAN, comp. and BLAND A. STEIN, comp.  
Washington May 1989 356 p Workshop held in Hampton,  
VA, 28 Jun. - 1 Jul. 1988

(NASA-CP-3035-PT-1; L-16575-PT-1; NAS 1.55:3035-PT-1)

Avail: NTIS HC A16/MF A02 CSCL 11G

CONFERENCES, EARTH ORBITAL ENVIRONMENTS,  
MICROMETEORIDS, OXYGEN ATOMS, RADIATION EFFECTS,  
SPACE DEBRIS, SPACECRAFT CHARGING, SPACECRAFT  
CONTAMINATION

**N89-23547\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **NASA/SDIO SPACE ENVIRONMENTAL EFFECTS ON MATERIALS WORKSHOP, PART 2**

LOUIS A. TEICHMAN, comp. and BLAND A. STEIN, comp.  
Washington May 1989 253 p Workshop held in Hampton,  
VA, 28 Jun. - 1 Jul. 1988

(NASA-CP-3035-PT-2; L-16575-PT-2; NAS 1.55:3035-PT-2)

Avail: NTIS HC A12/MF A02 CSCL 11G

EXTRATERRESTRIAL ENVIRONMENTS, MICROMETE-  
ORIDS, OXYGEN ATOMS, RADIATION EFFECTS, THERMAL  
RADIATION

**N90-24350\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **NATIONAL EDUCATORS' WORKSHOP: UPDATE 1989 STANDARD EXPERIMENTS IN ENGINEERING MATERIALS SCIENCE AND TECHNOLOGY**

JAMES E. GARDNER, comp. and JAMES A. JACOBS, comp.  
(Norfolk State Univ., VA.) Washington May 1990 182 p  
Workshop held in Hampton, VA, 17-19 Oct. 1989

(NAG1-976)

(NASA-CP-3074; L-16785; NAS 1.55:3074) Avail: NTIS HC

A09/MF A02 CSCL 07A

COMPUTER ASSISTED INSTRUCTION, CONFERENCES,  
DECISION MAKING, EDUCATION, ELECTROCHEMISTRY,  
EXPERIMENT DESIGN, FIBER COMPOSITES, MANUFACTUR-  
ING, NASA PROGRAMS, PLASTICS, PROCESS CONTROL  
(INDUSTRY), RESEARCH AND DEVELOPMENT, TECHNOL-  
OGIES, THERMAL CONDUCTIVITY

**N90-26075\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **PROCEEDINGS OF THE LDEF MATERIALS DATA ANALYSIS WORKSHOP**

BLAND A. STEIN, comp. and PHILIP R. YOUNG, comp. Jul.  
1990 289 p Workshop held at Cocoa Beach, FL, 13-14 Feb.  
1990

(NASA-CP-10046; NAS 1.55:10046) Avail: NTIS HC A13/MF

A02 CSCL 07A

CONFERENCES, DATA BASES, ENVIRONMENT EFFECTS,  
LIFE (DURABILITY), LONG DURATION EXPOSURE FACILITY,  
SPACEBORNE EXPERIMENTS, SPACECRAFT CONSTRUCTION  
MATERIALS

## 24

### COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates  
and other composite materials.

**N87-10184\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **EFFECTS OF THERMAL CYCLING ON GRAPHITE-FIBER-REINFORCED 6061 ALUMINUM**

G. A. DRIES (PRC Kentron, Inc., Hampton, Va.) and S. S.  
TOMPKINS Oct. 1986 29 p

(NASA-TP-2612; L-16139; NAS 1.60:2612) Avail: NTIS HC

A03/MF A01 CSCL 11D

ALUMINUM GRAPHITE COMPOSITES, CARBON FIBERS,  
METAL MATRIX COMPOSITES, REINFORCING FIBERS,  
SPACECRAFT STRUCTURES, THERMAL CYCLING TESTS

**N87-25435\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **PRELIMINARY STRUCTURAL DESIGN OF COMPOSITE MAIN ROTOR BLADES FOR MINIMUM WEIGHT**

MARK W. NIXON Jul. 1987 28 p Prepared in cooperation  
with Army Aviation Research and Development Command,  
Hampton, Va.

(DA PROJ. 1L1-62209-AH-76)

(NASA-TP-2730; L-16310; NAS 1.60:2730; AVSCOM-TM-87-B-6;  
AD-A180364) Avail: NTIS HC A03/MF A01 CSCL 11/4

BLADES, COMPOSITE MATERIALS, DYNAMIC STRUCTURAL  
ANALYSIS, HELICOPTERS, ROTORS, WEIGHT REDUCTION

**N87-29612\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **THE ACEE PROGRAM AND BASIC COMPOSITES RESEARCH AT LANGLEY RESEARCH CENTER (1975 TO 1986): SUMMARY AND BIBLIOGRAPHY**

MARVIN B. DOW Oct. 1987 147 p

(NASA-RP-1177; L-16290; NAS 1.61:1177) Avail: NTIS HC

A07/MF A01 CSCL 11D

Composites research conducted at the Langley Research  
Center during the period from 1975 to 1986 is described, and an  
annotated bibliography of over 600 documents (with their abstracts)  
is presented. The research includes Langley basic technology and  
the composite primary structures element of the NASA Aircraft  
Energy Efficiency (ACEE) Program. The basic technology  
documents cited in the bibliography are grouped according to the  
research activity such as design and analysis, fatigue and fracture,  
and damage tolerance. The ACEE documents cover development  
of composite structures for transport aircraft. Author

**N88-10117\*#** National Aeronautics and Space Administration.  
Goddard Space Flight Center, Greenbelt, MD.

### **OUTGASSING DATA FOR SELECTING SPACECRAFT MATERIALS**

WILLIAM A. CAMPBELL, JR. and RICHARD S. MARRIOTT Aug.  
1987 323 p Revised

(NASA-RP-1124; REPT-87B0347; NAS 1.61:1124) Avail: NTIS

HC A14/MF A02 CSCL 11D

Outgassing data, derived from tests at 398 K (125 C) for 24  
hours in vacuum as per ASTM E 595-77, 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 listed by likely usage  
and alphabetically. Author

**N88-25480\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **PROPERTIES OF TWO COMPOSITE MATERIALS MADE OF TOUGHENED EPOXY RESIN AND HIGH-STRAIN GRAPHITE FIBER**

MARVIN B. DOW and DONALD L. SMITH (PRC Kentron, Inc.,  
Hampton, Va.) Jul. 1988 44 p

(NASA-TP-2826; L-16425; NAS 1.60:2826) Avail: NTIS HC

A03/MF A01 CSCL 11D

COMPRESSIVE STRENGTH, EPOXY RESINS,  
GRAPHITE-EPOXY COMPOSITES, REINFORCING FIBERS

**N88-70029\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

### **EFFECTS OF CONTINUOUS AND CYCLIC THERMAL EXPOSURES ON BORON- AND BORSIC-REINFORCED 6061 ALUMINUM COMPOSITES**

GEORGE C. OLSEN and STEPHEN S. TOMPKINS Nov. 1977  
48 p

(NASA-TP-1063; L-11722; NAS 1.60:1063) Avail: NTIS

ALUMINUM, BORON, BORSIC (TRADENAME), COMPOSITE

MATERIALS, CYCLIC LOADS, METAL MATRIX COMPOSITES, THERMAL CYCLING TESTS

**N89-19385\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**THE EFFECTS OF SIMULATED SPACE ENVIRONMENTAL PARAMETERS ON SIX COMMERCIALY AVAILABLE COMPOSITE MATERIALS**

JOAN G. FUNK and GEORGE F. SYKES, JR. Apr. 1989 34 p (NASA-TP-2906; L-16549; NAS 1.60:2906) Avail: NTIS HC A03/MF A01 CSCL 11D

COMPOSITE MATERIALS, EARTH ORBITAL ENVIRONMENTS, FIBER COMPOSITES, RADIATION EFFECTS, SPACE ENVIRONMENT SIMULATION

**N89-27796\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**TUNGSTEN FIBER REINFORCED COPPER MATRIX COMPOSITES: A REVIEW**

DAVID L. MCDANIELS Sep. 1989 24 p (NASA-TP-2924; E-4318; NAS 1.60:2924) Avail: NTIS HC A03/MF A01 CSCL 11D

COPPER, FIBER COMPOSITES, METAL MATRIX COMPOSITES, STRESS-STRAIN RELATIONSHIPS, TUNGSTEN

**N90-10179\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**THE INTERLAMINAR FRACTURE TOUGHNESS OF WOVEN GRAPHITE/EPOXY COMPOSITES**

JOAN G. FUNK and JERRY W. DEATON Washington Nov. 1989 28 p (NASA-TP-2950; L-16629; NAS 1.60:2950) Avail: NTIS HC A03/MF A01 CSCL 11D

FABRICS, FRACTURE STRENGTH, GRAPHITE-EPOXY COMPOSITES, WEAVING

**N90-16007\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**INSTRUMENTED IMPACT AND RESIDUAL TENSILE STRENGTH TESTING OF EIGHT-PLY CARBON EPOXY SPECIMENS**

A. T. NETTLES Jan. 1990 43 p (NASA-TP-2981; NAS 1.60:2981) Avail: NTIS HC A03/MF A01 CSCL 11D

CARBON FIBERS, EPOXY MATRIX COMPOSITES, IMPACT STRENGTH, IMPACT TESTS

**N90-19302\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**HEAT TREATMENT STUDY OF THE SIC/TI-15-3 COMPOSITE SYSTEM Final Report**

BRADLEY A. LERCH, TIMOTHY P. GABB, and REBECCA A. MACKAY Washington Jan. 1990 31 p (NASA-TP-2970; E-4985; NAS 1.60:2970) Avail: NTIS HC A03/MF A01 CSCL 11D

AGING (METALLURGY), FIBER COMPOSITES, OXIDATION, SILICON CARBIDES, TENSILE STRENGTH, TITANATES

**N90-25198\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**LOW VELOCITY INSTRUMENTED IMPACT TESTING OF FOUR NEW DAMAGE TOLERANT CARBON/EPOXY COMPOSITE SYSTEMS**

D. G. LANCE and A. T. NETTLES Jul. 1990 39 p (NASA-TP-3029; NAS 1.60:3029) Avail: NTIS HC A03/MF A01 CSCL 11D

CARBON FIBERS, DAMAGE ASSESSMENT, EPOXY MATRIX COMPOSITES, IMPACT DAMAGE, IMPACT TESTS, LOW SPEED

**N90-26077\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**BUCKLING AND POSTBUCKLING BEHAVIOR OF SQUARE COMPRESSION-LOADED GRAPHITE-EPOXY PLATES WITH CIRCULAR CUTOUTS**

MICHAEL P. NEMETH Washington Aug. 1990 33 p Presented at the 8th DOD/NASA/FAA Conference on Fibrous Composites in Structural Design, Norfolk, VA, 28-30 1989 (NASA-TP-3007; L-16777; NAS 1.60:3007) Avail: NTIS HC

A03/MF A01 CSCL 11D  
BENDING, BUCKLING, COMPRESSION LOADS, GRAPHITE-EPOXY COMPOSITES, METAL PLATES, OPENINGS, ORTHOTROPIC PLATES

**N90-27788\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A PROTECTION AND DETECTION SURFACE (PADS) FOR DAMAGE TOLERANCE**

MARK J. SHUART, CHUNCHU B. PRASAD, and SHERRILL B. BIGGERS (Lockheed Aeronautical Systems Co., Burbank, CA.) Washington Sep. 1990 21 p

(NASA-TP-3011; L-16775; NAS 1.60:3011) Avail: NTIS HC A03/MF A01 CSCL 11D

AIRCRAFT STRUCTURES, COMPOSITE STRUCTURES, FAILURE, IMPACT DAMAGE, PROTECTION, TOLERANCES (MECHANICS)

**N90-27792\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**AMSAHTS 1990: ADVANCES IN MATERIALS SCIENCE AND APPLICATIONS OF HIGH TEMPERATURE SUPERCONDUCTORS**

YURY FLOM, ed. Washington Apr. 1990 137 p Conference held in Greenbelt, MD, 2-6 Apr. 1990

(NASA-CP-10043; REPT-90B00018; NAS 1.55:10043) Avail: NTIS HC A07/MF A02 CSCL 11D

CONFERENCES, HIGH TEMPERATURE SUPERCONDUCTORS, REACTION KINETICS, SURFACE REACTIONS, TECHNOLOGY UTILIZATION, THERMODYNAMIC PROPERTIES

**N90-27876\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**AN EXAMINATION OF IMPACT DAMAGE IN GLASS-PHENOLIC AND ALUMINUM HONEYCOMB CORE COMPOSITE PANELS**

A. T. NETTLES, D. G. LANCE, and A. J. HODGE Aug. 1990 25 p

(NASA-TP-3042; NAS 1.60:3042) Avail: NTIS HC A03/MF A01 CSCL 11D

ALUMINUM, GLASS FIBER REINFORCED PLASTICS, GRAPHITE-EPOXY COMPOSITES, HONEYCOMB CORES, IMPACT DAMAGE, PHENOLIC RESINS, SANDWICH STRUCTURES

## 25

## INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

**N87-18629\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ELECTRON STIMULATED DESORPTION OF ATOMIC OXYGEN FROM SILVER**

R. A. OUTLAW, W. K. PEREGOY, GAR B. HOFLUND (Florida Univ., Gainesville), and GREGORY R. CORALLO Apr. 1987 25 p

(NASA-TP-2668; L-16225; NAS 1.60:2668) Avail: NTIS HC A03/MF A01 CSCL 07D

ATOMIC BEAMS, DESORPTION, ELECTRON EMISSION, OXYGEN, SILVER, STIMULATED EMISSION

## 25 INORGANIC AND PHYSICAL CHEMISTRY

**N88-15846\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**AN ANALYTICAL STUDY OF THE HYDROGEN-AIR REACTION MECHANISM WITH APPLICATION TO SCRAMJET COMBUSTION**

CASIMIR J. JACHIMOWSKI Feb. 1988 18 p  
(NASA-TP-2791; L-16372; NAS 1.60:2791) Avail: NTIS HC A03/MF A01 CSCL 07D

CHEMICAL REACTIONS, COMBUSTION, HYDROGEN OXYGEN ENGINES, REACTION KINETICS, SUPERSONIC COMBUSTION RAMJET ENGINES

**N88-16830\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A RAPID METHOD FOR THE COMPUTATION OF EQUILIBRIUM CHEMICAL COMPOSITION OF AIR TO 15000 K**  
RAMADAS K. PRABHU (Planning Research Corp., Hampton, Va.) and WAYNE D. ERICKSON Mar. 1988 31 p  
(NASA-TP-2792; L-16375; NAS 1.60:2792) Avail: NTIS HC A03/MF A01 CSCL 07D

AIR, ATMOSPHERIC COMPOSITION, CHEMICAL COMPOSITION, CHEMICAL EQUILIBRIUM, COMPUTATION, HIGH TEMPERATURE

## 26

### METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

**N87-16902\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**CONVENTIONALLY CAST AND FORGED COPPER ALLOY FOR HIGH-HEAT-FLUX THRUST CHAMBERS**

JOHN M. KAZAROFF and GEORGE A. REPAS Feb. 1987 12 p  
(NASA-TP-2694; E-3304; NAS 1.60:2694) Avail: NTIS HC A03/MF A01 CSCL 11F

COMBUSTION CHAMBERS, COPPER ALLOYS, HEAT FLUX, HIGH TEMPERATURE, LININGS, SPACE SHUTTLE MAIN ENGINE

**N87-18644\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**EFFECT OF LID (REGISTERED) PROCESSING ON THE MICROSTRUCTURE AND MECHANICAL PROPERTIES OF Ti-6AL-4V AND Ti-6AL-2Sn-4Zr-2Mo TITANIUM FOIL-GAUGE MATERIALS**

LINDA B. BALCKBURN Apr. 1987 27 p  
(NASA-TP-2677; L-16098; NAS 1.60:2677) Avail: NTIS HC A03/MF A01 CSCL 11F

BONDING, DIFFUSION, INTERFACES, LIQUIDS, MECHANICAL PROPERTIES, MICROSTRUCTURE, PROTECTIVE COATINGS, TITANIUM ALLOYS

**N87-20407\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**MATERIAL CHARACTERIZATION OF SUPERPLASTICALLY FORMED TITANIUM (Ti-6AL-2Sn-4Zr-2Mo) SHEET**

WILLIAM A. OSSA (PRC Kentron, Inc., Hampton, Va.) and DICK M. ROYSTER 1987 38 p  
(NASA-TP-2674; L-16115; NAS 1.60:2674) Avail: NTIS HC A03/MF A01 CSCL 11F

AEROSPACE INDUSTRY, SUPERPLASTICITY, TENSILE CREEP, TITANIUM ALLOYS

**N87-21076\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**THE CORROSION MECHANISMS FOR PRIMER COATED 2219-T87 ALUMINUM**

MERLIN D. DANFORD and WARD W. KNOCKEMUS (Huntingdon Coll., Montgomery, Ala.) Apr. 1987 25 p  
(NASA-TP-2715; M-559; NAS 1.60:2715) Avail: NTIS HC A03/MF A01 CSCL 11F

ALUMINUM ALLOYS, CORROSION RESISTANCE, PRIMERS (COATINGS), PROTECTIVE COATINGS

**N87-25463\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**HYDROGEN TRAPPING AND THE INTERACTION OF HYDROGEN WITH METALS**

MERLIN D. DANFORD Jul. 1987 36 p  
(NASA-TP-2744; NAS 1.60:2744) Avail: NTIS HC A03/MF A01 CSCL 11F

CRYSTAL LATTICES, GAS-METAL INTERACTIONS, HYDROGEN, TRAPPING

**N87-27024\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**PERMEATION OF OXYGEN THROUGH HIGH PURITY, LARGE GRAIN SILVER**

R. A. OUTLAW, W. K. PEREGOY, and GAR B. HOF LUND (Florida Univ., Gainesville.) Sep. 1987 19 p  
(NASA-TP-2755; L-16305; NAS 1.60:2755) Avail: NTIS HC A03/MF A01 CSCL 11F

GRAIN BOUNDARIES, OXYGEN, PERMEATING, PURITY, SILVER

**N89-10996\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**INDENTATION PLASTICITY AND FRACTURE IN SILICON**

GEORGE C. RYBICKI and P. PIROUZ (Case Western Reserve Univ., Cleveland, Ohio.) Nov. 1988 30 p  
(NASA-TP-2863; E-4184; NAS 1.60:2863) Avail: NTIS HC A03/MF A01 CSCL 11B

CRYSTAL DISLOCATIONS, DOPED CRYSTALS, FRACTURE STRENGTH, HARDNESS, PLASTIC PROPERTIES, SILICON, SINGLE CRYSTALS, TRANSITION TEMPERATURE

**N89-17650\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**SECONDARY ELECTRON EMISSION CHARACTERISTICS OF UNTREATED AND ION-TEXTURED TITANIUM**

ARTHUR N. CURREN, KENNETH A. JENSEN, and GARY A. BLACKFORD (Case Western Reserve Univ., Cleveland, OH.) Mar. 1989 16 p  
(NASA-TP-2902; E-4495; NAS 1.60:2902) Avail: NTIS HC A03/MF A01 CSCL 11F

ELECTRON EMISSION, ION PLATING, MACHINING, SECONDARY EMISSION, SURFACE FINISHING, TITANIUM

**N89-19406\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**AN ELECTROCHEMICAL STUDY OF CORROSION PROTECTION BY PRIMER-TOPCOAT SYSTEMS ON 4130 STEEL WITH AC IMPEDANCE AND DC METHODS**

M. J. MENDREK, R. H. HIGGINS, and M. D. DANFORD May 1988 56 p  
(NASA-TP-2820; NAS 1.60:2820) Avail: NTIS HC A04/MF A01 CSCL 11F

ALTERNATING CURRENT, DIRECT CURRENT, ELECTROCHEMICAL CORROSION, IMPEDANCE, METAL SURFACES, PRIMERS (COATINGS), PROTECTIVE COATINGS, STAINLESS STEELS

**N89-26976\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**STRESS CORROSION STUDY OF PH13-8MO STAINLESS STEEL USING THE SLOW STRAIN RATE TECHNIQUE**

PABLO D. TORRES Washington Jul. 1989 32 p  
(NASA-TP-2934; NAS 1.60:2934) Avail: NTIS HC A03/MF A01  
CSCL 11F

AGING (METALLURGY), SALT SPRAY TESTS, STAINLESS  
STEELS, STRAIN RATE, STRESS CORROSION CRACKING

**N90-10248\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**EMITTANCE, CATALYSIS, AND DYNAMIC OXIDATION OF  
TI-14AL-21NB**

K. E. WIEDEMANN, R. K. CLARK, and S. N. SANKARAN (Analytical  
Services and Materials, Inc., Hampton, VA.) 1989 1 p Presented  
at the 1988 Annual Meeting of TMS AIME, Phoenix, AZ, Jan.  
1988

(NASA-TP-2955; L-16606; NAS 1.60:2955) PREVIEW CSCL  
11F

ALUMINUM ALLOYS, CATALYSIS, EMITTANCE, NIOBIUM  
ALLOYS, OXIDATION, OXIDATION RESISTANCE, TITANIUM  
ALLOYS

**N90-15211\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**SECONDARY ELECTRON EMISSION CHARACTERISTICS OF  
MOLYBDENUM-MASKED, ION-TEXTURED OFHC COPPER**

ARTHUR N. CURREN, KENNETH A. JENSEN, and ROBERT F.  
ROMAN Jan. 1990 15 p

(NASA-TP-2967; E-5009; NAS 1.60:2967) Avail: NTIS HC  
A03/MF A01 CSCL 11F

COPPER, ELECTRON BOMBARDMENT, MOLYBDENUM,  
SECONDARY EMISSION, TRAVELING WAVE TUBES

**N90-25206\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**OXIDATION CHARACTERISTICS OF TI-14AL-21NB INGOT  
ALLOY**

SANKARA N. SANKARAN, RONALD K. CLARK, JALALIAH UNNAM,  
and KARL E. WIEDEMANN (Analytical Services and Materials,  
Inc., Hampton, VA.) Washington Jul. 1990 24 p

(NASA-TP-3012; L-16658; NAS 1.60:3012) Avail: NTIS HC  
A03/MF A01 CSCL 11F

ALUMINUM OXIDES, INGOTS, NIOBIUM ALLOYS,  
OXIDATION, REACTION KINETICS, TEMPERATURE EFFECTS,  
TITANIUM ALLOYS

## 27

## NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics,  
elastomers, lubricants, polymers, textiles, adhesives, and ceramic  
materials.

**N87-12680\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**INVESTIGATION OF THE EFFECTS OF COBALT IONS ON  
EPOXY PROPERTIES**

J. J. SINGH and D. M. STOAKLEY Dec. 1986 16 p  
(NASA-TP-2639; L-16196; NAS 1.60:2639) Avail: NTIS HC  
A03/MF A01 CSCL 11G

COBALT, EPOXY RESINS, INVESTIGATION, IONS,  
MECHANICAL PROPERTIES

**N87-18666\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**ESTER OXIDATION ON AN ALUMINUM SURFACE USING  
CHEMILUMINESCENCE**

WILLIAM R. JONES, JR., MICHAEL A. MEADOR, and WILFREDO  
MORALES Jul. 1986 16 p

(NASA-TP-2611; E-2647; NAS 1.60:2611) Avail: NTIS HC  
A03/MF A01 CSCL 11B

ALUMINUM ALLOYS, CHEMILUMINESCENCE, ESTERS,  
METAL SURFACES, OXIDATION

**N87-20423\*#** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, AL.

**MICROGRAVITY CRYSTALLIZATION OF MACROMOLECULES:  
AN INTERIM REPORT AND PROPOSAL FOR CONTINUED  
RESEARCH**

BENJAMIN E. GOLDBERG Dec. 1986 26 p  
(NASA-TP-2671; NAS 1.60:2671) Avail: NTIS HC A03/MF A01  
CSCL 20B

MOLECULES, POLYMER CHEMISTRY, RECRYSTALLIZA-  
TION, REDUCED GRAVITY

**N88-23872\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**STRUCTURAL CERAMICS**

May 1986 226 p Workshop held in Cleveland, Ohio, 20-21  
May 1986 Sponsored by NASA, Washington

(NASA-CP-2427; E-3063; NAS 1.55:2427) Avail: NTIS HC  
A11/MF A02 CSCL 11B

CERAMICS, CONFERENCES, CORROSION, FRACTURE  
MECHANICS, NONDESTRUCTIVE TESTS, POLYMER  
CHEMISTRY, TRIBOLOGY

**N89-13642\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**THERMAL BARRIER COATINGS. ABSTRACTS AND FIGURES**

1985 220 p Workshop held in Cleveland, Ohio, 21-22 May  
1985

(NASA-CP-10019; E-4425; NAS 1.55:10019) Avail: NTIS HC  
A10/MF A02 CSCL 11C

BARRIER LAYERS, CONFERENCES, FAILURE ANALYSIS,  
GAS TURBINES, LIFE (DURABILITY), MATHEMATICAL MODELS,  
NONDESTRUCTIVE TESTS, PLASMA SPRAYING, THERMAL  
CONTROL COATINGS

**N89-21103\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**DEGRADATION AND CROSSLINKING OF PERFLUOROALKYL  
POLYETHERS UNDER X-RAY IRRADIATION IN ULTRAHIGH  
VACUUM**

SHIGEYUKI MORI (National Academy of Sciences - National  
Research Council, Washington, DC.) and WILFREDO MORALES  
Mar. 1989 15 p Prepared in cooperation with Iwate Univ.,  
Morioka (Japan)

(NASA-TP-2910; E-4500; NAS 1.60:2910) Avail: NTIS HC  
A03/MF A01 CSCL 11B

CROSSLINKING, PHOTOELECTRON SPECTROSCOPY,  
POLYETHER RESINS, RADIATION EFFECTS

**N89-25332\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**ABSORBED DOSE THRESHOLDS AND ABSORBED DOSE  
RATE LIMITATIONS FOR STUDIES OF ELECTRON  
RADIATION EFFECTS ON POLYETHERIMIDES**

EDWARD R. LONG, JR., SHEILA ANN T. LONG, STEPHANIE L.  
GRAY, and WILLIAM D. COLLINS (Old Dominion Univ., Norfolk,  
VA.) Washington Aug. 1989 22 p

(NASA-TP-2928; L-16585; NAS 1.60:2928) Avail: NTIS HC  
A03/MF A01 CSCL 11C

ELECTRON RADIATION, POLYETHER RESINS, POLYIMIDE  
RESINS, RADIATION ABSORPTION, RADIATION DOSAGE,  
RADIATION EFFECTS

**N89-28091\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**REACTION OF PERFLUOROALKYLPOLYETHERS (PFPE)  
WITH 440C STEEL IN VACUUM UNDER SLIDING CONDITIONS  
AT ROOM TEMPERATURE**

SHIGEYUKI MORI (Iwate Univ., Morioka, Japan) and WILFREDO  
MORALES Jan. 1989 12 p

(NASA-TP-2883; E-4209; NAS 1.60:2883) Avail: NTIS HC  
A03/MF A01 CSCL 07D

## 29 MATERIALS PROCESSING

ALKYL COMPOUNDS, PERFLUORO COMPOUNDS, POLYETHER RESINS, SLIDING FRICTION, STAINLESS STEELS, VACUUM EFFECTS

29

### MATERIALS PROCESSING

Includes space-based development of products and processes for commercial applications.

**N87-21141\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

#### MICROGRAVITY FLUID MANAGEMENT SYMPOSIUM

Apr. 1987 225 p Symposium held in Cleveland, Ohio, 9-10 Sep. 1986

(NASA-CP-2465; E-3386; NAS 1.55:2465) Avail: NTIS HC A10/MF A02 CSCL 22A

AEROSPACE ENVIRONMENTS, CONFERENCES, FLUID MANAGEMENT, WEIGHTLESSNESS

**N88-10977\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### PREPARATIVE ELECTROPHORESIS FOR SPACE

PERCY H. RHODES and ROBERT S. SNYDER Oct. 1987 15 p

(NASA-TP-2777; NAS 1.60:2777) Avail: NTIS HC A03/MF A01 CSCL 22A

CONVECTIVE FLOW, ELECTROHYDRODYNAMICS, ELECTROKINETICS, ELECTROPHORESIS, TEMPERATURE EFFECTS

**N88-10978\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### CONTINUOUS FLOW ELECTROPHORESIS SYSTEM

##### EXPERIMENTS ON SHUTTLE FLIGHTS STS-6 AND STS-7

ROBERT S. SNYDER, PERCY H. RHODES, and TERESA Y. MILLER Oct. 1987 17 p

(NASA-TP-2778; NAS 1.60:2778) Avail: NTIS HC A03/MF A01 CSCL 22A

CONVECTIVE FLOW, ELECTRICAL RESISTIVITY, ELECTRODYNAMICS, ELECTROPHORESIS, GRAVITATIONAL EFFECTS

**N88-14212\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### GROWTH OF SOLID SOLUTION SINGLE CRYSTALS

S. L. LEHOCZKY and F. R. SZOFRAN Dec. 1987 18 p

(NASA-TP-2787; NAS 1.60:2787) Avail: NTIS HC A03/MF A01 CSCL 20B

CRYSTAL GROWTH, MERCURY CADMIUM TELLURIDES, SINGLE CRYSTALS, SOLID SOLUTIONS, THERMOPHYSICAL PROPERTIES

**N88-23895\*#** National Aeronautics and Space Administration, Washington, DC.

#### NONCONTACT TEMPERATURE MEASUREMENT

MARK C. LEE, ed. Mar. 1988 429 p Workshop held in Washington, D.C., 30 Apr. - 1 May 1987

(NASA-CP-2503; NAS 1.55:2503) Avail: NTIS HC A19/MF A03 CSCL 12A

CONFERENCES, INFRARED RADIOMETERS, OPTICAL PYROMETERS, RADIATION PYROMETERS, TEMPERATURE MEASUREMENT, TEMPERATURE MEASURING INSTRUMENTS

**N89-17882\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

#### MICROGRAVITY COMBUSTION DIAGNOSTICS WORKSHOP

GILBERT J. SANTORO, ed., PAUL S. GREENBERG, ed., and NANCY D. PILTCH, ed. 1988 47 p Workshop held in Cleveland,

OH, 28-29 Jul. 1987

(NASA-CP-10017; E-4213; NAS 1.55:10017) Avail: NTIS HC A03/MF A01 CSCL 22A

COMBUSTION PHYSICS, CONFERENCES, DIAGNOSIS, REDUCED GRAVITY

31

### ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

**N87-22870\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### MODELING DIGITAL CONTROL SYSTEMS WITH MA-PREFILTERED MEASUREMENTS

MICHAEL E. POLITES Jun. 1987 23 p

(NASA-TP-2732; NAS 1.60:2732) Avail: NTIS HC A03/MF A01 CSCL 13H

CONTROL SYSTEMS DESIGN, DIGITAL FILTERS, DIGITAL SYSTEMS, STATE VECTORS, SYSTEMS ENGINEERING

**N87-24585\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### A NEW APPROACH TO STATE ESTIMATION IN DETERMINISTIC DIGITAL CONTROL SYSTEMS

MICHAEL E. POLITES Jul. 1987 16 p

(NASA-TP-2745; NAS 1.60:2745) Avail: NTIS HC A03/MF A01 CSCL 09B

CONTROL SYSTEMS DESIGN, DIGITAL SYSTEMS, STATE ESTIMATION

**N87-27067\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### EXACT STATE RECONSTRUCTION IN DETERMINISTIC DIGITAL CONTROL SYSTEMS

MICHAEL E. POLITES Aug. 1987 19 p

(NASA-TP-2757; NAS 1.60:2757) Avail: NTIS HC A03/MF A01 CSCL 13H

DIGITAL COMMAND SYSTEMS, STATE ESTIMATION, STATE VECTORS

**N88-17869\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### A GENERALIZED METHOD FOR AUTOMATIC DOWNHAND AND WIREFEED CONTROL OF A WELDING ROBOT AND POSITIONER

KEN FERNANDEZ and GEORGE E. COOK (Vanderbilt Univ., Nashville, Tenn.) Feb. 1988 54 p

(NASA-TP-2807; NAS 1.60:2807) Avail: NTIS HC A04/MF A01 CSCL 13H

ARC WELDING, COMPUTER AIDED DESIGN, COMPUTER AIDED MANUFACTURING, PROGRAM VERIFICATION (COMPUTERS), ROBOT CONTROL, ROBOTICS, ROBOTS

**N88-18751\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

#### FURTHER DEVELOPMENTS IN EXACT STATE RECONSTRUCTION IN DETERMINISTIC DIGITAL CONTROL SYSTEMS

MICHAEL E. POLITES Mar. 1988 19 p

(NASA-TP-2812; NAS 1.60:2812) Avail: NTIS HC A03/MF A01 CSCL 13B

CONTROL SYSTEMS DESIGN, DIGITAL SYSTEMS, EQUATIONS OF STATE, RECONSTRUCTION, STATE ESTIMATION

**N88-28177\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**MORE ON EXACT STATE RECONSTRUCTION IN DETERMINISTIC DIGITAL CONTROL SYSTEMS**

MICHAEL E. POLITES Sep. 1988 21 p  
(NASA-TP-2847; NAS 1.60:2847) Avail: NTIS HC A03/MF A01 CSCL 13B

CONTROL SYSTEMS DESIGN, DIGITAL SYSTEMS, PLANT DESIGN, RECONSTRUCTION, STATE ESTIMATION

**N89-24507\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**FURTHER DEVELOPMENTS IN MODELING DIGITAL CONTROL SYSTEMS WITH MA-PREFILTERED MEASUREMENTS**

MICHAEL E. POLITES Washington Mar. 1989 20 p  
(NASA-TP-2909; M-612; NAS 1.60:2909) Avail: NTIS HC A03/MF A01 CSCL 13B

ACCELEROMETERS, CONTROL SYSTEMS DESIGN, DIGITAL FILTERS, DIGITAL SYSTEMS, GYROSCOPES, STAR TRACKERS

**N89-27039\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**A NEW STATE RECONSTRUCTOR FOR DIGITAL CONTROLS SYSTEMS USING WEIGHTED-AVERAGE MEASUREMENTS**

MICHAEL E. POLITES Washington Aug. 1989 17 p  
(NASA-TP-2936; M-615; NAS 1.60:2936) Avail: NTIS HC A03/MF A01 CSCL 09B

CONTROL SYSTEMS DESIGN, DIGITAL TECHNIQUES, RECONSTRUCTION, STATE ESTIMATION

**N90-16968\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**AN AUGER ELECTRON SPECTROSCOPY STUDY OF SURFACE-PREPARATION CONTAMINANTS**

D. WU (Old Dominion Univ., Norfolk, VA.), R. M. STEPHENS, R. A. OUTLAW, and P. HOPSON Washington Feb. 1990 16 p  
(NASA-TP-2972; L-16653; NAS 1.60:2972) Avail: NTIS HC A03/MF A01 CSCL 13B

AUGER SPECTROSCOPY, CLEANING, CONTAMINANTS, ELECTRON SPECTROSCOPY, ELECTROPOLISHING, SURFACE FINISHING

**N90-21210\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**INFLUENCE OF THE DEPOSITION CONDITIONS ON RADIOFREQUENCY MAGNETRON SPUTTERED MOS2 FILMS**

PIERRE A. STEINMANN and TALIVALDIS SPALVINS Apr. 1990 11 p  
(NASA-TP-2994; E-5181; NAS 1.60:2994) Avail: NTIS HC A03/MF A01 CSCL 13B

DEPOSITION, LUBRICANTS, MAGNETRON SPUTTERING, MORPHOLOGY, RADIO FREQUENCIES, STOICHIOMETRY, THIN FILMS

**N90-21219\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**A GENERAL-PURPOSE BALLOON-BORNE POINTING SYSTEM FOR SOLAR SCIENTIFIC INSTRUMENTS**

M. E. POLITES Washington May 1990 22 p  
(NASA-TP-3013; NAS 1.60:3013) Avail: NTIS HC A03/MF A01 CSCL 131

BALLOON-BORNE INSTRUMENTS, CONTROL SYSTEMS DESIGN, POINTING CONTROL SYSTEMS, SOLAR INSTRUMENTS, THREE AXIS STABILIZATION

**N90-25255\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**ROTATING-UNBALANCED-MASS DEVICES FOR SCANNING BALLOON-BORNE EXPERIMENTS, FREE-FLYING SPACECRAFT, AND SPACE SHUTTLE/SPACE STATION EXPERIMENTS**

MICHAEL E. POLITES Jun. 1990 17 p  
(NASA-TP-3030; NAS 1.60:3030) Avail: NTIS HC A03/MF A01 CSCL 14B

POINTING CONTROL SYSTEMS, ROTATING BODIES, SPACE SHUTTLES, SPACE STATION PAYLOADS, SPACE STATIONS, SPACEBORNE EXPERIMENTS

**N90-28754\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**DEVELOPMENT AND APPROACH TO LOW-FREQUENCY MICROGRAVITY ISOLATION SYSTEMS**

CARLOS M. GRODSINSKY Washington Aug. 1990 24 p  
(NASA-TP-2984; E-5287; NAS 1.60:2984) Avail: NTIS HC A03/MF A01 CSCL 22A

GRAVITATIONAL EFFECTS, PAYLOADS, REDUCED GRAVITY, SPACE SHUTTLES, SPACE STATIONS, SPACEBORNE EXPERIMENTS, VIBRATION ISOLATORS

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## COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications.

**N87-11916\*#** National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, VA.

**PULSE CODE MODULATION (PCM) ENCODER HANDBOOK FOR AYDIN VECTOR MMP-600 SERIES SYSTEM**

S. F. CURRIER and W. R. POWELL Washington, D.C. Aug. 1986 139 p  
(NASA-RP-1171; NAS 1.61:1171) Avail: NTIS HC A07/MF A01 CSCL 17B

The hardware and software characteristics of a time division multiplex system are described. The system is used to sample analog and digital data. The data is merged with synchronization information to produce a serial pulse coded modulation (PCM) bit stream. Information presented herein is required by users to design compatible interfaces and assure effective utilization of this encoder system. GSFC/Wallops Flight Facility has flown approximately 50 of these systems through 1984 on sounding rockets with no inflight failures. Aydin Vector manufactures all of the components for these systems.  
Author

**N87-12718\*#** National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, VA.

**PULSE CODE MODULATION (PCM) DATA STORAGE AND ANALYSIS USING A MICROCOMPUTER**

D. E. MASSEY Aug. 1986 8 p  
(NASA-TP-2629; REPT-822.3; NAS 1.60:2629) Avail: NTIS HC A02/MF A01 CSCL 17B

DATA PROCESSING, DATA REDUCTION, DATA STORAGE, MICROCOMPUTERS, PULSE CODE MODULATION

**N87-17971\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**BIT-ERROR-RATE TESTING OF HIGH-POWER 30-GHZ TRAVELING WAVE TUBES FOR GROUND-TERMINAL APPLICATIONS**

KURT A. SHALKHAUSER and GENE FUJIKAWA Oct. 1986 16 p  
(NASA-TP-2635; E-2996; NAS 1.60:2635) Avail: NTIS HC A03/MF A01 CSCL 17B

BIT ERROR RATE, PERFORMANCE TESTS, TRANSMISSION EFFICIENCY, TRAVELING WAVE TUBES

**N87-20448\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**UNIQUE BIT-ERROR-RATE MEASUREMENT SYSTEM FOR SATELLITE COMMUNICATION SYSTEMS**

## 32 COMMUNICATIONS AND RADAR

MARY JO WINDMILLER Mar. 1987 13 p  
(NASA-TP-2699; E-3322; NAS 1.60:2699) Avail: NTIS HC  
A03/MF A01 CSCL 17B

BIT ERROR RATE, COMMUNICATION NETWORKS,  
SATELLITE COMMUNICATION, SYSTEMS ANALYSIS

N87-24590\*# National Aeronautics and Space Administration.  
Wallops Flight Center, Wallops Island, VA.

**A SYNCHRONOUS DATA ANALYZER FOR THE MINIMUM  
DELAY DATA FORMAT (MDDF) AND LAUNCH TRAJECTORY  
ACQUISITION SYSTEM (LTAS)**

ANDREW J. GREEN Jul. 1987 10 p  
(NASA-TP-2743; REPT-822.1; NAS 1.60:2743) Avail: NTIS HC  
A02/MF A01 CSCL 17B

DATA REDUCTION, LAUNCHING, SAMPLING,  
SYNCHRONISM, TRAJECTORY ANALYSIS

N88-14226\*# Colorado Univ., Boulder. Dept. of Electrical  
Engineering.

**PROPAGATION EFFECTS ON SATELLITE SYSTEMS AT  
FREQUENCIES BELOW 10 GHZ: A HANDBOOK FOR  
SATELLITE SYSTEMS DESIGN**

WARREN L. FLOCK Dec. 1987 501 p  
(NAS7-100; JPL-956249)  
(NASA-RP-1108/2; NAS 1.61:1108/2) Avail: NTIS HC A22/MF  
A03 CSCL 22D

Frequencies below 10 GHz continue to be used for a large portion of satellite service, and new applications, including mobile satellite service and the global positioning system, use frequencies below 10 GHz. As frequency decreases below 10 GHz, attenuation due to precipitation and gases decreases and ionospheric effects increase. Thus the ionosphere, which can be largely neglected above 10 GHz, receives major attention. Although attenuation and depolarization due to rain are less severe below 10 GHz than above, they are nevertheless still important and constitute another major topic. The handbook emphasizes the propagation effects on satellite communications but material that is pertinent to radio navigation and positioning systems and deep-space telecommunications is included as well. Chapter 1 through 7 describe the various propagation impairments, and Chapter 9 is devoted to the estimation or calculation of the magnitudes of these effects for use in system design. Chapter 10 covers link power budget equations and the role of propagation effects in these equations. Chapter 8 deals with the complex subject of interference between space and terrestrial systems. Author

N89-17060\*# Westinghouse Electric Corp., Baltimore, MD.  
**PROPAGATION EFFECTS HANDBOOK FOR SATELLITE  
SYSTEMS DESIGN. A SUMMARY OF PROPAGATION  
IMPAIRMENTS ON 10 TO 100 GHZ SATELLITE LINKS WITH  
TECHNIQUES FOR SYSTEM DESIGN**

LOUIS J. IPPOLITO Washington, DC Feb. 1989 531 p  
(NAS7-100; JPL-958178)  
(NASA-RP-1082(04); NAS 1.61:1082(04)) Avail: NTIS HC  
A23/MF A03 CSCL 20N

The NASA Propagation Effects Handbook for Satellite Systems Design provides a systematic compilation of the major propagation effects experienced on space-Earth paths in the 10 to 100 GHz frequency band region. It provides both a detailed description of the propagation phenomenon and a summary of the impact of the effect on the communications system design and performance. Chapter 2 through 5 describe the propagation effects, prediction models, and available experimental data bases. In Chapter 6, design techniques and prediction methods available for evaluating propagation effects on space-Earth communication systems are presented. Chapter 7 addresses the system design process and how the effects of propagation on system design and performance should be considered and how that can be mitigated. Examples of operational and planned Ku, Ka, and EHF satellite communications systems are given. Author

N89-17767\*# National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**UNIVERSAL TEST FIXTURE FOR MONOLITHIC MM-WAVE  
INTEGRATED CIRCUITS CALIBRATED WITH AN AUGMENTED  
TRD ALGORITHM**

ROBERT R. ROMANOVSKY and KURT A. SHALKHAUSER Mar.  
1989 42 p Presented at the 13th International Conference on  
Infrared and mm-Waves, Honolulu, Hawaii, 5-9 Dec. 1988  
(NASA-TP-2875; E-3983; NAS 1.60:2875) Avail: NTIS HC  
A03/MF A01 CSCL 09C

ALGORITHMS, CALIBRATING, INTEGRATED CIRCUITS,  
MICROWAVE CIRCUITS, MILLIMETER WAVES, SOLID STATE  
DEVICES

N90-11915\*# National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**SATELLITE-MATRIX-SWITCHED,  
TIME-DIVISION-MULTIPLE-ACCESS NETWORK SIMULATOR**

WILLIAM D. IVANCIC, MONTY ANDRO, LAWRENCE A. NAGY,  
JAMES M. BUDINGER, and MARY JO SHALKHAUSER  
Washington Oct. 1989 21 p Proposed for presentation at the  
13th AIAA International Communication Satellite System  
Conference, 11-15 Mar. 1990

(NASA-TP-2944; E-4813; NAS 1.60:2944) Avail: NTIS HC  
A03/MF A01 CSCL 17B

COMMUNICATION NETWORKS, COMMUNICATION  
SATELLITES, SIMULATORS, TIME DIVISION MULTIPLE  
ACCESS

## 33

### ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

N87-11072\*# National Aeronautics and Space Administration.  
Goddard Space Flight Center, Greenbelt, MD.

**THE 1985 GODDARD SPACE FLIGHT CENTER BATTERY  
WORKSHOP**

G. MORROW, ed. Sep. 1986 427 p Workshop held in  
Greenbelt, Md., 19-21 Nov. 1985  
(NASA-CP-2434; REPT-86B0366; NAS 1.55:2434) Avail: NTIS  
HC A19/MF A03 CSCL 10C

CONFERENCES, ENERGY STORAGE, LITHIUM SULFUR  
BATTERIES, NICKEL CADMIUM BATTERIES, NICKEL  
HYDROGEN BATTERIES

N87-17990\*# National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**PERFORMANCE OF TEXTURED CARBON ON COPPER  
ELECTRODE MULTISTAGE DEPRESSED COLLECTORS WITH  
MEDIUM-POWER TRAVELING WAVE TUBES**

PETER RAMINS and ARTHUR N. CURREN Nov. 1986 12 p  
(NASA-TP-2665; E-3143; NAS 1.60:2665) Avail: NTIS HC  
A03/MF A01 CSCL 09A

ACCUMULATORS, CURRENT DENSITY, ELECTRODES,  
ELECTRON EMISSION, TRAVELING WAVE TUBES

N87-17991\*# National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**CALCULATION OF SECONDARY ELECTRON TRAJECTORIES  
IN MULTISTAGE DEPRESSED COLLECTORS FOR  
MICROWAVE AMPLIFIERS**

DALE A. FORCE Nov. 1986 7 p  
(NASA-TP-2664; E-3196; NAS 1.60:2664) Avail: NTIS HC  
A02/MF A01 CSCL 09A

ACCUMULATORS, ELECTRON EMISSION, MICROWAVE



## 34 FLUID MECHANICS AND HEAT TRANSFER

AMPLIFIERS, PARTICLE TRAJECTORIES, TRAVELING WAVE TUBES

**N87-20474\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**DESIGN, FABRICATION AND PERFORMANCE OF SMALL, GRAPHITE ELECTRODE, MULTISTAGE DEPRESSED COLLECTORS WITH 200-W, CW, 8- TO 18-GHZ TRAVELING-WAVE TUBES**

BEN T. EBIHARA and PETER RAMINS Feb. 1987 22 p (NASA-TP-2693; E-3099; NAS 1.60:2693) Avail: NTIS HC A03/MF A01 CSCL 09A

ACCUMULATORS, DESIGN ANALYSIS, ELECTRODES, FABRICATION, PYROLYTIC GRAPHITE, TRAVELING WAVE TUBES

**N87-21239\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**TRAVELING-WAVE-TUBE EFFICIENCY IMPROVEMENT BY A LOW-COST TECHNIQUE FOR DEPOSITION OF CARBON ON MULTISTAGE DEPRESSED COLLECTOR**

BEN T. EBIHARA, PETER RAMINS, and SHELLY PEET May 1987 14 p (NASA-TP-2719; E-3416; NAS 1.60:2719) Avail: NTIS HC A03/MF A01 CSCL 09A

CARBON, COPPER, DEPOSITION, ELECTRODES, THIN FILMS, TRAVELING WAVE TUBES

**N87-22923\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**REVISED NASA AXIALLY SYMMETRIC RING MODEL FOR COUPLED-CAVITY TRAVELING-WAVE TUBES**

JEFFREY D. WILSON Jan. 1987 17 p (NASA-TP-2675; E-3220; NAS 1.60:2675) Avail: NTIS HC A03/MF A01 CSCL 09A

AXISYMMETRIC BODIES, CAVITIES, COUPLED MODES, MODELS, RINGS, TRAVELING WAVE TUBES

**N87-25532\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**ANALYTICAL AND EXPERIMENTAL PERFORMANCE OF A DUAL-MODE TRAVELING WAVE TUBE AND MULTISTAGE DEPRESSED COLLECTOR**

PETER RAMINS, DALE A. FORCE, and HENRY G. KOSMAHL Aug. 1987 29 p (NASA-TP-2752; E-3470; NAS 1.60:2752) Avail: NTIS HC A03/MF A01 CSCL 09A

ACCUMULATORS, ELECTRON BEAMS, TRAVELING WAVE TUBES

**N88-11021\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**THE 1986 GODDARD SPACE FLIGHT CENTER BATTERY WORKSHOP**

GEORGE W. MORROW, ed. and THOMAS Y. YI, ed. Sep. 1987 374 p Workshop held in Greenbelt, Md., 18-19 Nov. 1986 (NASA-CP-2486; REPT-87B0408; NAS 1.55:2486) Avail: NTIS HC A16/MF A03 CSCL 10C

CONFERENCES, ELECTROCHEMISTRY, FAILURE ANALYSIS, FLIGHT TESTS, LITHIUM SULFUR BATTERIES, NICKEL CADMIUM BATTERIES, NICKEL HYDROGEN BATTERIES

**N88-15146\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**PERFORMANCE OF A SMALL, GRAPHITE ELECTRODE, MULTISTAGE DEPRESSED COLLECTOR WITH A 500-W, CONTINUOUS WAVE, 4.8- TO 9.8-GHZ TRAVELING WAVE TUBE**

PETER RAMINS, GARY G. LESNY, BEN T. EBIHARA, and SHELLY PEET Feb. 1988 15 p (NASA-TP-2788; E-3800; NAS 1.60:2788) Avail: NTIS HC A03/MF A01 CSCL 09A

ACCUMULATORS, CONTINUOUS RADIATION, ELECTRODES, GRAPHITE, TRAVELING WAVE TUBES

**N89-15337\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**PERFORMANCE OF A MULTISTAGE DEPRESSED COLLECTOR WITH MACHINED TITANIUM ELECTRODES**

PETER RAMINS and BEN T. EBIHARA Jan. 1989 10 p (NASA-TP-2891; E-4400; NAS 1.60:2891) Avail: NTIS HC A02/MF A01 CSCL 09A

ACCUMULATORS, ELECTRODES, MACHINING, PERFORMANCE TESTS, TITANIUM

**N89-21169\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**ANALYTICAL AND EXPERIMENTAL PROCEDURES FOR DETERMINING PROPAGATION CHARACTERISTICS OF MILLIMETER-WAVE GALLIUM ARSENIDE MICROSTRIP LINES**

ROBERT R. ROMANOFSKY Mar. 1989 21 p (NASA-TP-2899; E-4273; NAS 1.60:2899) Avail: NTIS HC A03/MF A01 CSCL 20N

ELECTROMAGNETIC RADIATION, MICROSTRIP TRANSMISSION LINES, MICROWAVE TRANSMISSION, REFLECTANCE

**N89-21171\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**DESIGN, FABRICATION, AND PERFORMANCE OF BRAZED, GRAPHITE ELECTRODE, MULTISTAGE DEPRESSED COLLECTORS WITH 500-W, CONTINUOUS WAVE, 4.8- TO 9.6-GHZ TRAVELING-WAVE TUBES**

PETER RAMINS and BEN EBIHARA Mar. 1989 18 p (NASA-TP-2904; E-4361; NAS 1.60:2904) Avail: NTIS HC A03/MF A01 CSCL 09A

BRAZING, CONTINUOUS RADIATION, ELECTRODE MATERIALS, ELECTRON EMISSION, SOLID ELECTRODES, TRAVELING WAVE TUBES

**N90-27965\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**SPENT-BEAM REFOCUSING ANALYSIS AND MULTISTAGE DEPRESSED COLLECTOR DESIGN FOR A 75-W, 59- TO 64-GHZ COUPLED-CAVITY TRAVELING-WAVE TUBE**

JEFFREY D. WILSON, PETER RAMINS, and DALE A. FORCE Aug. 1990 22 p (NASA-TP-3039; E-5455; NAS 1.60:3039) Avail: NTIS HC A03/MF A01 CSCL 09A

ACCUMULATORS, COMPUTER AIDED DESIGN, DESIGN ANALYSIS, TRAVELING WAVE TUBES

## 34

## FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

**N87-11963\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ON THE MAXWELLIAN DISTRIBUTION, SYMMETRIC FORM, AND ENTROPY CONSERVATION FOR THE EULER EQUATIONS**

S. M. DESHPANDE Nov. 1986 30 p (NASA-TP-2583; L-16036; NAS 1.60:2583) Avail: NTIS HC A03/MF A01 CSCL 20D

ENTROPY, EULER EQUATIONS OF MOTION, MAXWELL-BOLTZMANN DENSITY FUNCTION

**N87-13664\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**AEROTHERMAL TESTS OF SPHERICAL DOME PROTUBERANCES ON A FLAT PLATE AT A MACH NUMBER OF 6.5**

## 34 FLUID MECHANICS AND HEAT TRANSFER

C. E. GLASS and L. R. HUNT Dec. 1986 61 p  
(NASA-TP-2631; L-16160; NAS 1.60:2631) Avail: NTIS HC  
A04/MF A01 CSCL 20D

**AEROTHERMODYNAMICS, HYPERSONIC VEHICLES,  
LAMINAR BOUNDARY LAYER, PREDICTION ANALYSIS  
TECHNIQUES, PROTUBERANCES, THERMAL PROTECTION,  
TILES, TURBULENT BOUNDARY LAYER**

**N87-17000\*#** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, AL.  
**SPACE SHUTTLE MAIN ENGINE HIGH PRESSURE FUEL  
PUMP AFT PLATFORM SEAL CAVITY FLOW ANALYSIS**  
S. A. LOWRY and L. W. KEETON (CHAM of North America, Inc.,  
Huntsville, Ala.) Jan. 1987 134 p  
(NASA-TP-2685; NAS 1.60:2685) Avail: NTIS HC A07/MF A01  
CSCL 20D

**CAVITIES, FUEL PUMPS, HIGH PRESSURE, SEALS  
(STOPPERS), SPACE SHUTTLE MAIN ENGINE, TURBINE  
PUMPS**

**N87-18034\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.  
**JET MODEL FOR SLOT FILM COOLING WITH EFFECT OF  
FREE-STREAM AND COOLANT TURBULENCE**  
FREDERICK F. SIMON Oct. 1986 21 p  
(NASA-TP-2655; E-2961; NAS 1.60:2655) Avail: NTIS HC  
A03/MF A01 CSCL 20D

**FILM COOLING, FLOW VELOCITY, JET ENGINES,  
NUMERICAL ANALYSIS, TURBULENCE EFFECTS, WALL JETS**

**N87-18035\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.  
**VELOCITY PROFILES IN LAMINAR DIFFUSION FLAMES**  
VALERIE J. LYONS and JANICE M. MARGLE (Pennsylvania State  
Univ., Abington) May 1986 13 p Presented at the Combustion  
Inst. Meeting, Cleveland, Ohio, 5-6 May 1986  
(NASA-TP-2596; E-2879; NAS 1.60:2596) Avail: NTIS HC  
A03/MF A01 CSCL 20D

**CYCLOHEXANE, DIFFUSION FLAMES, ETHYL ALCOHOL,  
HEPTANES, LAMINAR FLOW, OCTANES, TEMPERATURE  
PROFILES, VELOCITY MEASUREMENT**

**N87-18782\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.  
**AEROTHERMAL EVALUATION OF A SPHERICALLY BLUNTED  
BODY WITH A TRAPEZOIDAL CROSS SECTION IN THE  
LANGLEY 8-FOOT HIGH-TEMPERATURE TUNNEL**  
CINDY W. ALBERTSON Apr. 1987 83 p  
(NASA-TP-2641; L-16096; NAS 1.60:2641) Avail: NTIS HC  
A05/MF A01 CSCL 20D

**BOUNDARY LAYERS, FLOW DISTRIBUTION, HEAT  
TRANSFER, PREDICTIONS, PRESSURE MEASUREMENT,  
THERMAL PROTECTION**

**N87-18783\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.  
**A SECOND-ORDER ACCURATE KINETIC-THEORY-BASED  
METHOD FOR INVISCID COMPRESSIBLE FLOWS**  
SURESH M. DESHPANDE Dec. 1986 42 p  
(NASA-TP-2613; L-16050; NAS 1.60:2613) Avail: NTIS HC  
A03/MF A01 CSCL 20D

**BOLTZMANN TRANSPORT EQUATION, EULER EQUATIONS  
OF MOTION, KINETIC THEORY, NUMERICAL ANALYSIS, SHOCK  
WAVE PROPAGATION**

**N87-22103\*#** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, AL.  
**SPACELAB 3 MISSION SCIENCE REVIEW**  
GEORGE H. FICHTL, ed., JOHN S. THEON, ed. (National  
Aeronautics and Space Administration, Washington, D.C.),  
CHARLES K. HILL, ed., and OTHA H. VAUGHAN, ed. Feb.  
1987 98 p Symposium held in Huntsville, Ala., 4 Dec. 1985  
(NASA-CP-2429; M-547; NAS 1.55:2429) Avail: NTIS HC  
A05/MF A01 CSCL 22A

**AEROSPACE ENVIRONMENTS, POSTFLIGHT ANALYSIS,  
REDUCED GRAVITY, SPACE COMMERCIALIZATION, SPACE  
SHUTTLES, SPACEBORNE EXPERIMENTS, SPACELAB**

**N87-23921\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**THREE-STEP LABYRINTH SEAL FOR HIGH-PERFORMANCE  
TURBOMACHINES**

ROBERT C. HENDRICKS Jun. 1987 75 p  
(NASA-TP-1848; E-3186; NAS 1.60:1848) Avail: NTIS HC  
A04/MF A01 CSCL 20D

**FUEL PUMPS, LABYRINTH SEALS, SPACE SHUTTLE MAIN  
ENGINE, STATIC TESTS, TURBOMACHINERY**

**N87-23936\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**STRAIGHT CYLINDRICAL SEAL FOR HIGH-PERFORMANCE  
TURBOMACHINES**

ROBERT C. HENDRICKS Jun. 1987 76 p  
(NASA-TP-1850; E-3184; NAS 1.60:1850) Avail: NTIS HC  
A05/MF A01 CSCL 20D

**CYLINDRICAL BODIES, FUEL PUMPS, SEALS (STOPPERS),  
SPACE SHUTTLE MAIN ENGINE, TURBINE PUMPS,  
TURBOMACHINERY**

**N87-24639\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**THREE-STEP CYLINDRICAL SEAL FOR HIGH-PERFORMANCE  
TURBOMACHINES**

ROBERT C. HENDRICKS Jun. 1987 79 p  
(NASA-TP-1849; E-3185; NAS 1.60:1849) Avail: NTIS HC  
A05/MF A01 CSCL 20D

**DYNAMIC STABILITY, FUEL PUMPS, LEAKAGE, PUMP  
SEALS, SPACE SHUTTLE MAIN ENGINE, TURBINE PUMPS**

**N87-24672\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**MULTISCALE TURBULENCE EFFECTS IN SUPERSONIC JETS  
EXHAUSTING INTO STILL AIR**

KHALED S. ABDOL-HAMID (Analytical Services and Materials, Inc.,  
Hampton, Va.) and RICHARD G. WILMOTH Jul. 1987 38 p  
(NASA-TP-2707; L-16258; NAS 1.60:2707) Avail: NTIS HC  
A03/MF A01 CSCL 20D

**JET EXHAUST, NAVIER-STOKES EQUATION, SUPERSONIC  
AIRCRAFT, TURBULENCE**

**N87-26309\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**SIMPLIFIED CURVE FITS FOR THE THERMODYNAMIC  
PROPERTIES OF EQUILIBRIUM AIR**

S. SRINIVASAN, J. C. TANNEHILL (Iowa State Univ. of Science  
and Technology, Ames.), and K. J. WEILMUNSTER Aug. 1987  
48 p  
(NAG1-313)

(NASA-RP-1181; L-16276; NAS 1.61:1181) Avail: NTIS HC  
A03/MF A01 CSCL 20D

New, improved curve fits for the thermodynamic properties of  
equilibrium air have been developed. The curve fits are for pressure,  
speed of sound, temperature, entropy, enthalpy, density, and  
internal energy. These curve fits can be readily incorporated into  
new or existing computational fluid dynamics codes if real gas  
effects are desired. The curve fits are constructed from Grabau-type  
transition functions to model the thermodynamic surfaces in a  
piecewise manner. The accuracies and continuity of these curve  
fits are substantially improved over those of previous curve fits.  
These improvements are due to the incorporation of a small number  
of additional terms in the approximating polynomials and careful  
choices of the transition functions. The ranges of validity of the  
new curve fits are temperatures up to 25 000 K and densities  
from 10 to the  $-7$  to 10 to the 3d power amagats. Author

## 34 FLUID MECHANICS AND HEAT TRANSFER

**N87-27161\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### **APPLICATION OF TURBULENCE MODELING TO PREDICT SURFACE HEAT TRANSFER IN STAGNATION FLOW REGION OF CIRCULAR CYLINDER**

CHI R. WANG and FREDERICK C. YEH Sep. 1987 25 p  
(NASA-TP-2758; E-3418; NAS 1.60:2758) Avail: NTIS HC  
A03/MF A01 CSCL 20D

CIRCULAR CYLINDERS, HEAT TRANSFER, MODELS, STAGNATION FLOW, SURFACE PROPERTIES, TURBULENCE

**N87-29778\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **DESCRIPTION AND CALIBRATION OF THE LANGLEY HYPERSONIC CF4 TUNNEL: A FACILITY FOR SIMULATING LOW GAMMA FLOW AS OCCURS FOR A REAL GAS**

RAYMOND E. MIDDEN and CHARLES G. MILLER, III Mar. 1985 78 p

(NASA-TP-2384; L-15798; NAS 1.60:2384) Avail: NTIS HC  
A05/MF A01 CSCL 20D

CALIBRATING, CARBON TETRAFLUORIDE, HYPERSONIC WIND TUNNELS, MACH NUMBER, REAL GASES, TEST FACILITIES

**N87-29795\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **FINITE-ELEMENT REENTRY HEAT-TRANSFER ANALYSIS OF SPACE SHUTTLE ORBITER**

WILLIAM L. KO, ROBERT D. QUINN, and LESLIE GONG Dec. 1986 59 p

(NASA-TP-2657; H-1236; NAS 1.60:2657) Avail: NTIS HC  
A04/MF A01 CSCL 20D

AERODYNAMIC HEATING, FINITE ELEMENT METHOD, HEAT TRANSFER COEFFICIENTS, REENTRY SHIELDING, SPACE SHUTTLE ORBITERS, THERMAL ANALYSIS

**N88-14299\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **FLIGHT AND WIND-TUNNEL MEASUREMENTS SHOWING BASE DRAG REDUCTION PROVIDED BY A TRAILING DISK FOR HIGH REYNOLDS NUMBER TURBULENT FLOW FOR SUBSONIC AND TRANSONIC MACH NUMBERS**

SHERYLL GOECKE POWERS, JARRETT K. HUFFMAN, and CHARLES H. FOX, JR. (National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.) Nov. 1986 143 p

(NASA-TP-2638; H-1281; NAS 1.60:2638) Avail: NTIS HC  
A07/MF A01 CSCL 20D

BASE PRESSURE, DRAG REDUCTION, FLIGHT TESTS, TRAILING EDGE FLAPS, TURBULENT FLOW, WIND TUNNEL TESTS

**N88-15924\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### **CRYOGENIC FLUID MANAGEMENT TECHNOLOGY WORKSHOP. VOLUME 1: PRESENTATION MATERIAL AND DISCUSSION**

JOHN C. AYDELOTT, ed. and WILLIAM DEVOL, ed. (Sverdrup Technology, Inc., Middleburg Heights, Ohio.) Sep. 1987 386 p  
Workshop held in Cleveland, Ohio, 28-30 Apr. 1987

(NASA-CP-10001; E-3732; NAS 1.55:10001) Avail: NTIS HC  
A17/MF A03 CSCL 20D

CONFERENCES, CRYOGENIC COOLING, CRYOGENIC FLUID STORAGE, CRYOGENIC FLUIDS, CRYOGENIC ROCKET PROPELLANTS, CRYOGENICS, REDUCED GRAVITY

**N88-18881\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.

### **INFLUENCE OF BASE MODIFICATIONS ON IN-FLIGHT BASE DRAG IN THE PRESENCE OF JET EXHAUST FOR MACH NUMBERS FROM 0.7 TO 1.5**

SHERYLL GOECKE POWERS Feb. 1988 20 p

(NASA-TP-2802; H-1408; NAS 1.60:2802) Avail: NTIS HC  
A03/MF A01 CSCL 20D

BASE FLOW, DRAG, FLIGHT TESTS, JET EXHAUST, MACH NUMBER, REVISIONS

**N88-18884\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **GALILEO PROBE PARACHUTE TEST PROGRAM: WAKE PROPERTIES OF THE GALILEO PROBE AT MACH NUMBERS FROM 0.25 TO 0.95**

THOMAS N. CANNING (Canning, T. N., Portola Valley, Calif.) and THOMAS M. EDWARDS Apr. 1988 144 p

(NAS2-10000)  
(NASA-RP-1130; A-9643; NAS 1.61:1130) Avail: NTIS HC  
A07/MF A01 CSCL 20D

The results of surveys of the near and far wake of the Galileo Probe are presented for Mach numbers from 0.25 to 0.95. The trends in the data resulting from changes in Mach number, radial and axial distance, angle of attack, and a small change in model shape are shown in crossplots based on the data. A rationale for selecting an operating volume suitable for parachute inflation based on low Mach number flight results is outlined. Author

**N88-20599\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### **CRYOGENIC FLUID MANAGEMENT TECHNOLOGY WORKSHOP. VOLUME 2: ROUNDTABLE DISCUSSION OF TECHNOLOGY REQUIREMENTS**

Mar. 1988 84 p Workshop held in Cleveland, Ohio, 28-30 Apr. 1987

(NASA-CP-10009; E-3987; NAS 1.55:10009) Avail: NTIS HC  
A05/MF A01 CSCL 20D

CONFERENCES, CRYOGENIC FLUIDS, FLUID MANAGEMENT, TECHNOLOGY ASSESSMENT

**N88-22325\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **AEROTHERMAL TESTS OF QUILTED DOME MODELS ON A FLAT PLATE AT A MACH NUMBER OF 6.5**

CHRISTOPHER E. GLASS and L. ROANE HUNT May 1988 72 p

(NASA-TP-2804; L-16346; NAS 1.60:2804) Avail: NTIS HC  
A04/MF A01 CSCL 20D

AEROTHERMODYNAMICS, HYPERSONIC AIRCRAFT, LAMINAR BOUNDARY LAYER, PRESSURE DISTRIBUTION, THERMAL PROTECTION, TURBULENT BOUNDARY LAYER

**N89-11153\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **MIXING AND DEMIXING PROCESSES IN MULTIPHASE FLOWS WITH APPLICATION TO PROPULSION SYSTEMS**

RAND DECKER, ed. and CHARLES F. SCHAFER, ed. Jul. 1988 191 p Workshop was held in Huntsville, Ala., 25-26 Feb. 1988; sponsored by NASA, Marshall Space Flight Center, Huntsville, Ala. and USRA, Huntsville, Ala. Sponsored by NASA, Washington, D.C.

(NASA-CP-3006; M-591; NAS 1.55:3006) Avail: NTIS HC  
A09/MF A02 CSCL 20D

COMBUSTION PHYSICS, CONFERENCES, FLUID DYNAMICS, FUEL COMBUSTION, LAMINAR FLOW, MIXING, MULTIPHASE FLOW, PROPULSION, TURBULENT FLOW

**N89-12822\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **AERODYNAMIC PRESSURES AND HEATING RATES ON SURFACES BETWEEN SPLIT ELEVONS AT MACH 6.6**

L. ROANE HUNT Washington, D.C. Dec. 1988 85 p  
(NASA-TP-2855; L-16460; NAS 1.60:2855) Avail: NTIS HC  
A05/MF A01 CSCL 20D

AERODYNAMIC HEATING, DYNAMIC PRESSURE, ELEVONS, HYPERSONIC FLIGHT, SPLIT FLAPS

## 34 FLUID MECHANICS AND HEAT TRANSFER

**N89-16115\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **CONSERVATION EQUATIONS AND PHYSICAL MODELS FOR HYPERSONIC AIR FLOWS IN THERMAL AND CHEMICAL NONEQUILIBRIUM**

PETER A. GNOFFO, ROOP N. GUPTA (Scientific Research and Technology, Inc., Hampton, VA.), and JUDY L. SHINN Washington, DC Feb. 1989 62 p  
(NASA-TP-2867; L-16477; NAS 1.60:2867) Avail: NTIS HC A04/MF A01 CSCL 20D

AIR FLOW, CHEMICAL EQUILIBRIUM, CONSERVATION EQUATIONS, HYPERSONIC FLOW, MATHEMATICAL MODELS, NONEQUILIBRIUM FLOW, NONEQUILIBRIUM THERMODYNAMICS

**N89-19499\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **CONTAMINATION OF LIQUID OXYGEN BY PRESSURIZED GASEOUS NITROGEN**

ALLAN J. ZUCKERWAR, TRACY K. KING, and KIM CHI NGO (Old Dominion Univ., Norfolk, VA.) Apr. 1989 26 p  
(NASA-TP-2894; L-16526; NAS 1.60:2894) Avail: NTIS HC A03/MF A01 CSCL 20D

FUEL CONTAMINATION, GAS-GAS INTERACTIONS, GASEOUS DIFFUSION, HYPERSONIC WIND TUNNELS, LIQUID NITROGEN, LIQUID OXYGEN, PRESSURE EFFECTS

**N89-25409\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### **DETERMINATION OF COMBUSTION GAS TEMPERATURES BY INFRARED RADIOMETRY IN SOOTING AND NONSOOTING FLAMES**

VALERIE J. LYONS and CARMEN M. GRACIA-SALCEDO (Army Aviation Systems Command, Cleveland, OH.) Feb. 1989 13 p  
(DA PROJ. 11.1-61102-AH-45)  
(NASA-TP-2900; E-4446; NAS 1.60:2900; AVSCOM-TR-88-C-008; AD-A205373) Avail: NTIS HC A03/MF A01 CSCL 21/2

COMBUSTION TEMPERATURE, FLAME TEMPERATURE, GAS TEMPERATURE, INFRARED RADIOMETERS, PREMIXED FLAMES, RADIATION PYROMETERS, SOOT, TEMPERATURE MEASUREMENT

**N89-26184\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

### **WORKSHOP ON TWO-PHASE FLUID BEHAVIOR IN A SPACE ENVIRONMENT**

THEODORE D. SWANSON, ed., AL JUHASZ, ed., W. RUSS LONG, ed. (National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.), and LAURA OTTENSTEIN, ed. 1989 45 p Workshop held in Ocean City, MD, 13-14 Jun. 1988

(NASA-CP-3043; REPT-89B00114; NAS 1.55:3043) Avail: NTIS HC A03/MF A01 CSCL 20D

AEROSPACE ENVIRONMENTS, FLUID MANAGEMENT, HEAT TRANSFER, LIQUID-VAPOR INTERFACES, TWO PHASE FLOW

**N89-27116\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **A REVIEW OF HIGH-SPEED, CONVECTIVE, HEAT-TRANSFER COMPUTATION METHODS**

MICHAEL E. TAUBER Washington Jul. 1989 38 p  
(NASA-TP-2914; A-89042; NAS 1.60:2914) Avail: NTIS HC A03/MF A01 CSCL 20D

AERODYNAMIC HEATING, COMPUTATION, CONVECTIVE HEAT TRANSFER, LAMINAR BOUNDARY LAYER, SEPARATED FLOW, SHOCK HEATING, TURBULENT BOUNDARY LAYER

**N90-10385\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **CONSTITUTIVE RELATIONSHIPS AND MODELS IN CONTINUUM THEORIES OF MULTIPHASE FLOWS**

RAND DECKER, ed. Washington Sep. 1989 165 p Workshop held in Huntsville, AL, 5-7 Apr. 1989; sponsored by NASA,

Washington and USRA, Washington, DC

(NASA-CP-3047; M-616; NAS 1.55:3047) Avail: NTIS HC A08/MF A01 CSCL 20D

CONSTITUTIVE EQUATIONS, CONTINUUM MECHANICS, MATHEMATICAL MODELS, MULTIPHASE FLOW

**N90-11245\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### **LASER ANEMOMETER MEASUREMENTS IN A TRANSONIC AXIAL-FLOW FAN ROTOR**

ANTHONY J. STRAZISAR, JERRY R. WOOD, MICHAEL D. HATHAWAY, and KENNETH L. SUDER Washington Nov. 1989 216 p

(NASA-TP-2879; E-4480; NAS 1.60:2879) Avail: NTIS HC A10/MF A02 CSCL 20D

AXIAL FLOW, FAN BLADES, FLOW VELOCITY, LASER ANEMOMETERS, ROTOR BLADES (TURBOMACHINERY), SURVEYS, TRANSONIC FLOW, VELOCITY DISTRIBUTION

**N90-14493\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **SURFACE FLOW AND HEATING DISTRIBUTIONS ON A CYLINDER IN NEAR WAKE OF AEROASSIST FLIGHT EXPERIMENT (AFE) CONFIGURATION AT INCIDENCE IN MACH 10 AIR**

WILLIAM L. WELLS Jan. 1990 58 p

(NASA-TP-2954; L-16623; NAS 1.60:2954) Avail: NTIS HC A04/MF A01 CSCL 20D

COMPUTER PROGRAMS, CYLINDRICAL BODIES, FREE FLOW, HEAT TRANSFER, NAVIER-STOKES EQUATION, NEAR WAKES

**N90-17042\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **AN UPWIND-BIASED, POINT-IMPLICIT RELAXATION ALGORITHM FOR VISCOUS, COMPRESSIBLE PERFECT-GAS FLOWS**

PETER A. GNOFFO Washington Feb. 1990 75 p

(NASA-TP-2953; L-16588; NAS 1.60:2953) Avail: NTIS HC A04/MF A01 CSCL 20D

ALGORITHMS, COMPRESSIBLE FLOW, GAS FLOW, HYPERSONIC FLOW, RELAXATION METHOD (MATHEMATICS), THREE DIMENSIONAL FLOW, VISCOUS FLOW

**N90-23670\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **AERODYNAMIC PRESSURE AND HEATING-RATE DISTRIBUTIONS IN TILE GAPS AROUND CHINE REGIONS WITH PRESSURE GRADIENTS AT A MACH NUMBER OF 6.6**

L. ROANE HUNT and KRISTOPHER K. NOTESTINE (PRC Kentron, Inc., Hampton, VA.) Washington Jun. 1990 70 p

(NASA-TP-2988; L-16649; NAS 1.60:2988) Avail: NTIS HC A04/MF A01 CSCL 20D

AERODYNAMIC LOADS, HEATING, HIGH PRESSURE, HYPERSONIC SPEED, THERMAL PROTECTION, TILES

**N90-27064\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **A REVIEW OF REACTION RATES AND THERMODYNAMIC AND TRANSPORT PROPERTIES FOR AN 11-SPECIES AIR MODEL FOR CHEMICAL AND THERMAL NONEQUILIBRIUM CALCULATIONS TO 30000 K**

ROOP N. GUPTA, JERROLD M. YOS, RICHARD A. THOMPSON, and KAM-PUI LEE (Scientific Research and Technology, Inc., Hampton, VA.) Washington Aug. 1990 90 p

(NASA-RP-1232; L-16634; NAS 1.61:1232) Avail: NTIS HC A05/MF A01 CSCL 20D

Reaction rate coefficients and thermodynamic and transport properties are reviewed and supplemented for the 11-species air model which can be used for analyzing flows in chemical and thermal nonequilibrium up to temperatures of 3000 K. Such flows will likely occur around currently planned and future hypersonic vehicles. Guidelines for determining the state of the surrounding

environment are provided. Curve fits are given for the various species properties for their efficient computation in flowfield codes. Approximate and more exact formulas are provided for computing the properties of partially ionized air mixtures in a high energy environment. Limitations of the approximate mixing laws are discussed for a mixture of ionized species. An electron number-density correction for the transport properties of the charged species is obtained. This correction has been generally ignored in the literature. Author

**N90-27066\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**AN APPROXIMATE METHOD FOR CALCULATING THREE-DIMENSIONAL INVISCID HYPERSONIC FLOW FIELDS**  
CHRISTOPHER J. RILEY and FRED R. DEJARNETTE  
Washington Aug. 1990 26 p  
(NASA-TP-3018; L-16745; NAS 1.60:3018) Avail: NTIS HC A03/MF A01 CSCL 20D

APPROXIMATION, EULER EQUATIONS OF MOTION, FLOW DISTRIBUTION, HYPERSONIC FLOW, INVISCID FLOW, THREE DIMENSIONAL FLOW

**N90-28806\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**GAS-JET AND TANGENT-SLOT FILM COOLING TESTS OF A 12.5 DEG CONE AT MACH NUMBER OF 6.7**

ROBERT J. NOWAK May 1988 85 p  
(NASA-TP-2786; L-16148; NAS 1.60:2786) Avail: NTIS HC A05/MF A01 CSCL 20D

FILM COOLING, GAS JETS, HEAT TRANSFER, MATHEMATICAL MODELS, PRESSURE MEASUREMENT, SHOCK LAYERS, SLOTS, TEMPERATURE MEASUREMENT

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## INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

**N87-10263\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**THIRTEENTH INTERNATIONAL LASER RADAR CONFERENCE**  
Aug. 1986 335 p Conference held in Toronto, Ontario, 11-15 Aug. 1986; sponsored by NASA, Washington, D.C., Atmospheric Environment Service, and York Univ.  
(NASA-CP-2431; L-16201; NAS 1.55:2431) Avail: NTIS HC A15/MF A03 CSCL 20E

CONFERENCES, LASER APPLICATIONS, LASERS, METEOROLOGICAL PARAMETERS, MIDDLE ATMOSPHERE, OPTICAL RADAR, RADAR EQUIPMENT

**N87-13731\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**EVALUATION OF DIFFUSE-ILLUMINATION HOLOGRAPHIC CINEMATOGRAPHY IN A FLUTTER CASCADE**

A. J. DECKER Jul. 1986 33 p  
(NASA-TP-2593; E-2937; NAS 1.60:2593) Avail: NTIS HC A03/MF A01 CSCL 14E

CINEMATOGRAPHY, FLOW VISUALIZATION, HOLOGRAPHIC INTERFEROMETRY, HOLOGRAPHY, LASER OUTPUTS, THREE DIMENSIONAL FLOW

**N87-20514\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A SIMPLIFIED METHOD FOR DETERMINING HEAT OF COMBUSTION OF NATURAL GAS**

JAG J. SINGH, HOSHANG CHEGINI (Old Dominion Univ., Norfolk, Va.), and GERALD H. MALL (Computer Sciences Corp., Hampton,

Va.) Apr. 1987 15 p  
(NASA-TP-2682; L-16261; NAS 1.60:2682) Avail: NTIS HC A03/MF A01 CSCL 14B

GAS DETECTORS, HEAT OF COMBUSTION, NATURAL GAS, OXYGEN SUPPLY EQUIPMENT

**N88-28286\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**OPTICAL MEASUREMENT OF PROPELLER BLADE DEFLECTIONS**

ANATOLE P. KURKOV Sep. 1988 31 p  
(NASA-TP-2841; E-4131; NAS 1.60:2841) Avail: NTIS HC A03/MF A01 CSCL 14B

DEFLECTION, DISPLACEMENT MEASUREMENT, OPTICAL MEASUREMENT, PROPELLER BLADES

**N88-30099\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**MEASUREMENT OF LOCAL HIGH-LEVEL, TRANSIENT SURFACE HEAT FLUX**

CURT H. LIEBERT Sep. 1988 9 p Sponsored by NASA, Washington, D.C.  
(NASA-TP-2840; E-4200; NAS 1.60:2840) Avail: NTIS HC A02/MF A01 CSCL 14B

HEAT FLUX, SURFACE TEMPERATURE, TEMPERATURE MEASUREMENT, TEMPERATURE MEASURING INSTRUMENTS, TRANSIENT HEATING

**N89-13762\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**SPATIAL VISION PROCESSES: FROM THE OPTICAL IMAGE TO THE SYMBOLIC STRUCTURES OF CONTOUR INFORMATION**

DANIEL J. JOBSON Nov. 1988 31 p Original contains color illustrations  
(NASA-TP-2838; L-16479; NAS 1.60:2838) Avail: NTIS HC A03/MF A01 CSCL 14B

COMPUTER VISION, CONTOURS, EDGES, IMAGE PROCESSING, SPATIAL FILTERING, SYMBOLS, TEXTURES

**N89-15380\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**TECHNIQUE FOR TEMPERATURE COMPENSATION OF EDDY-CURRENT PROXIMITY PROBES**

ROBERT M. MASTERS Jan. 1989 10 p  
(NASA-TP-2880; E-4316; NAS 1.60:2880) Avail: NTIS HC A02/MF A01 CSCL 14B

EDDY CURRENTS, EVALUATION, PERFORMANCE TESTS, PROBES, PROXIMITY, TEMPERATURE COMPENSATION, TEMPERATURE MEASUREMENT, TURBOMACHINERY

**N89-16139\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**RAMAN INTENSITY AS A PROBE OF CONCENTRATION NEAR A CRYSTAL GROWING IN SOLUTION**

R. ALLEN WILKINSON Feb. 1989 12 p  
(NASA-TP-2865; E-4397; NAS 1.60:2865) Avail: NTIS HC A03/MF A01 CSCL 14B

CRYSTAL GROWTH, RAMAN SPECTRA, RAMAN SPECTROSCOPY, SOLUTIONS

**N89-26209\*#** National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, VA.

**MARA (MULTIMODE AIRBORNE RADAR ALTIMETER) SYSTEM DOCUMENTATION. VOLUME 1: MARA SYSTEM REQUIREMENTS DOCUMENT**

C. L. PARSONS, ed. Jul. 1989 88 p  
(NASA-RP-1226; REPT-89-143; NAS 1.61:1226) Avail: NTIS HC A05/MF A01 CSCL 14B

The Multimode Airborne Radar Altimeter (MARA), a flexible airborne radar remote sensing facility developed by NASA's Goddard Space Flight Center, is discussed. This volume describes the scientific justification for the development of the instrument and the translation of these scientific requirements into instrument

## 35 INSTRUMENTATION AND PHOTOGRAPHY

design goals. Values for key instrument parameters are derived to accommodate these goals, and simulations and analytical models are used to estimate the developed system's performance.

Author

**N90-10412\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **INTRODUCTION TO TOTAL- AND PARTIAL-PRESSURE MEASUREMENTS IN VACUUM SYSTEMS**

R. A. OUTLAW and F. A. KERN Washington Nov. 1989 77 p  
(NASA-RP-1219; L-16494; NAS 1.61:1219) Avail: NTIS HC A05/MF A01 CSCL 14B

An introduction to the fundamentals of total and partial pressure measurement in the vacuum regime (760 x 10 to the -16th power Torr) is presented. The instrument most often used in scientific fields requiring vacuum measurement are discussed with special emphasis on ionization type gauges and quadrupole mass spectrometers. Some attention is also given to potential errors in measurement as well as calibration techniques. Author

**N90-16204\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **VISUAL INFORMATION PROCESSING FOR TELEVISION AND TELEROBOTICS**

FRIEDRICH O. HUCK, ed. and STEPHEN K. PARK, ed. (College of William and Mary, Williamsburg, VA.) Washington Nov. 1989 263 p Workshop held in Williamsburg, VA, 10-12 May 1989 (NASA-CP-3053; L-16665; NAS 1.55:3053) Avail: NTIS HC A12/MF A02 CSCL 14B

CODING, COMPUTER VISION, CONFERENCES, IMAGE RECONSTRUCTION, IMAGING TECHNIQUES, ROBOTICS, ROBOTS, TELEOPERATORS, TELEROBOTICS, TELEVISION SYSTEMS

**N90-17085\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### **NASA LASER LIGHT SCATTERING ADVANCED TECHNOLOGY DEVELOPMENT WORKSHOP, 1988**

WILLIAM V. MEYER, ed. (Case Western Reserve Univ., Cleveland, OH.) Aug. 1989 306 p Workshop held in Cleveland, OH, 7-8 Sep. 1988  
(NASA-CP-10033; E-4915; NAS 1.55:10033) Avail: NTIS HC A14/MF A02 CSCL 14B

FIBER OPTICS, LASER BEAMS, LIGHT SCATTERING, PHOTODIODES, REDUCED GRAVITY, SPECTROSCOPY

**N90-21351\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### **FOUNDATIONS OF MEASUREMENT AND INSTRUMENTATION**

ISIDORE WARSHAWSKY Apr. 1990 232 p  
(NASA-RP-1222; E-3786; NAS 1.61:1222) Avail: NTIS HC A11/MF A02 CSCL 14B

The user of instrumentation has provided an understanding of the factors that influence instrument performance, selection, and application, and of the methods of interpreting and presenting the results of measurements. Such understanding is prerequisite to the successful attainment of the best compromise among reliability, accuracy, speed, cost, and importance of the measurement operation in achieving the ultimate goal of a project. Some subjects covered are dimensions; units; sources of measurement error; methods of describing and estimating accuracy; deduction and presentation of results through empirical equations, including the method of least squares; experimental and analytical methods of determining the static and dynamic behavior of instrumentation systems, including the use of analogs. Author

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## LASERS AND MASERS

Includes parametric amplifiers.

**N87-20522\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **CLOSED-CYCLE, FREQUENCY-STABLE CO<sub>2</sub> LASER TECHNOLOGY**

CARMEN E. BATTEN, ed., IRVIN M. MILLER, ed., GEORGE M. WOOD, JR., ed., and DAVID V. WILLETTS, ed. (Royal Signals and Radar Establishment, Malvern, England.) Apr. 1987 279 p Workshop held in Hampton, Va., 10-12 Jun. 1986  
(NASA-CP-2456; L-16271; NAS 1.55:2456) Avail: NTIS HC A13/MF A02 CSCL 20E

CARBON DIOXIDE LASERS, CLOSED CYCLES, FREQUENCY STABILITY, RESEARCH MANAGEMENT

**N87-27994\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **FREQUENCY DOMAIN LASER VELOCIMETER SIGNAL PROCESSOR: A NEW SIGNAL PROCESSING SCHEME**

JAMES F. MEYERS and JAMES I. CLEMMONS, JR. Sep. 1987 38 p  
(NASA-TP-2735; L-16209; NAS 1.60:2735) Avail: NTIS HC A03/MF A01 CSCL 20E

DOMAINS, FREQUENCIES, LASER DOPPLER VELOCIMETERS, SIGNAL PROCESSING

**N89-17855\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **ANALYSIS OF ND<sub>3</sub>+ : GLASS, SOLAR-PUMPED, HIGH-POWER LASER SYSTEMS**

L. E. ZAPATA and M. D. WILLIAMS Feb. 1989 13 p  
(NASA-TP-2905; L-16085; NAS 1.60:2905) Avail: NTIS HC A03/MF A01 CSCL 20E

GLASS LASERS, HIGH POWER LASERS, NEODYMIUM LASERS, SOLAR COLLECTORS

**N90-24585\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **DIODE LASER SATELLITE SYSTEMS FOR BEAMED POWER TRANSMISSION**

M. D. WILLIAMS, J. H. KWON (Miami Univ., Oxford, OH.), G. H. WALKER, and D. H. HUMES Washington 1990 31 p  
(NASA-TP-2992; L-16669; NAS 1.60:2992) Avail: NTIS HC A03/MF A01 CSCL 20E

ESTIMATING, LASER POWER BEAMING, OPERATING TEMPERATURE, SATELLITE TRANSMISSION, SEMICONDUCTOR LASERS, STRUCTURAL DESIGN CRITERIA

**N90-24586\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **LOW-TEMPERATURE CO-OXIDATION CATALYSTS FOR LONG-LIFE CO<sub>2</sub> LASERS**

DAVID R. SCHRYER, ed. and GAR B. HOF LUND, ed. (Florida Univ., Gainesville.) Washington Jun. 1990 404 p Conference held in Hampton, VA, 17-19 Oct. 1989; sponsored by NASA, Washington and the Royal Signals and Radar Establishment, Malvern, England  
(NASA-CP-3076; L-16797; NAS 1.55:3076) Avail: NTIS HC A18/MF A03 CSCL 20E

CARBON DIOXIDE LASERS, CATALYSTS, CATALYTIC ACTIVITY, CONFERENCES, LOW TEMPERATURE, OXIDATION

## MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

**N87-10391\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**TESTING OF UH-60A HELICOPTER TRANSMISSION IN NASA LEWIS 2240-KW (3000-HP) FACILITY**

A. M. MITCHELL, F. B. OSWALD, and H. H. COE Aug. 1986 30 p

(NASA-TP-2626; E-2941; NAS 1.60:2626) Avail: NTIS HC A03/MF A01 CSCL 13I

HELICOPTERS, TRANSMISSIONS (MACHINE ELEMENTS), VIBRATION MEASUREMENT

**N87-18095\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**PREDICTED EFFECT OF DYNAMIC LOAD ON PITTING FATIGUE LIFE FOR LOW-CONTACT-RATIO SPUR GEARS**

DAVID G. LEWICKI Jun. 1986 19 p

(NASA-TP-2610; E-2989; NAS 1.60:2610; AD-A170906; AVSCOM-TR-86-C-21) Avail: NTIS HC A03/MF A01 CSCL 13/9

APPLICATIONS PROGRAMS (COMPUTERS), DYNAMIC LOADS, FATIGUE (MATERIALS), GEARS, LIFE (DURABILITY), PITTING

**N87-18821\*#** National Aeronautics and Space Administration, Washington, DC.

**TETHER DYNAMICS SIMULATION**

Feb. 1987 338 p Workshop held in Arlington, Va., 16 Sep. 1986

(NASA-CP-2458; NAS 1.55:2458) Avail: NTIS HC A15/MF A02 CSCL 22B

COMPUTERIZED SIMULATION, ELECTRODYNAMICS, TETHERED SATELLITES, TETHERLINES

**N87-20555\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**VIBRATION CHARACTERISTICS OF OH-58A HELICOPTER MAIN ROTOR TRANSMISSION**

DAVID G. LEWICKI and JOHN J. COY Apr. 1987 18 p

(NASA-TP-2705; E-3368; NAS 1.60:2705; AVSCOM-TR-86-C-42; AD-A180364) Avail: NTIS HC A03/MF A01 CSCL 01/3

HELICOPTERS, ROTOR AERODYNAMICS, TRANSMISSIONS (MACHINE ELEMENTS), VIBRATION MEASUREMENT

**N87-22199\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**ROTORDYNAMIC INSTABILITY PROBLEMS IN HIGH-PERFORMANCE TURBOMACHINERY, 1986**

Jan. 1987 548 p Workshop held in College Station, Tex., 2-4 Jun. 1986; sponsored in cooperation with Texas A&M Univ., Army Research Office, and Air Force Aeropropulsion Lab.

(NASA-CP-2443; E-3136; NAS 1.55:2443) Avail: NTIS HC A23/MF A03 CSCL 13I

ROTOR AERODYNAMICS, STABILITY, TURBOCOMPRESSORS, TURBOMACHINERY

**N87-22235\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**GEAR TOOTH STRESS MEASUREMENTS ON THE UH-60A HELICOPTER TRANSMISSION**

FRED B. OSWALD Mar. 1987 17 p

(NASA-TP-2698; E-3357; NAS 1.60:2698) Avail: NTIS HC A03/MF A01 CSCL 13I

GEAR TEETH, STRESS MEASUREMENT, TRANSMISSIONS (MACHINE ELEMENTS), UH-60A HELICOPTER

**N88-15224\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**EFFICIENCY TESTING OF A HELICOPTER TRANSMISSION PLANETARY REDUCTION STAGE**

ROBERT F. HANDSCHUH and DOUGLAS A. ROHN Feb. 1988 18 p Prepared in cooperation with Army Aviation Research and Development Command, Cleveland, Ohio

(DA PROJ. 1L1-61102-AH-45)

(NASA-TP-2795; E-3770; NAS 1.60:2795; AVSCOM-TR-87-C-28; AD-A191884) Avail: NTIS HC A03/MF A01 CSCL 13/9

ENGINE TESTS GEARS, HELICOPTER ENGINES, POWER EFFICIENCY, TRANSMISSIONS (MACHINE ELEMENTS)

**N88-17045\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**DYNAMIC ANALYSIS OF MULTIMESH-GEAR HELICOPTER TRANSMISSIONS**

FRED K. CHOY, DENNIS P. TOWNSEND, and FRED B. OSWALD Feb. 1988 22 p

(NASA-TP-2789; E-3191; NAS 1.60:2789) Avail: NTIS HC A03/MF A01 CSCL 13I

DYNAMIC CHARACTERISTICS, GEARS, HELICOPTER ENGINES, SYSTEMS ANALYSIS, TRANSMISSIONS (MACHINE ELEMENTS)

**N88-18933\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**COMPUTER-AIDED DESIGN ANALYSIS OF 57-MM, ANGULAR-CONTACT, CRYOGENIC TURBOPUMP BEARINGS**

ELIZABETH S. ARMSTRONG and HAROLD H. COE Mar. 1988 15 p

(NASA-TP-2816; E-3890; NAS 1.60:2816) Avail: NTIS HC A03/MF A01 CSCL 13K

BEARINGS, COMPUTER AIDED DESIGN, CRYOGENIC FLUIDS, RETROFITTING, REVISIONS, SERVICE LIFE, SPACE SHUTTLE MAIN ENGINE, TURBINE PUMPS

**N89-21243\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**COMPARISON STUDY OF GEAR DYNAMIC COMPUTER PROGRAMS AT NASA LEWIS RESEARCH CENTER**

JAMES J. ZAKRAJSEK Mar. 1989 31 p Prepared in cooperation with Army Aviation Research and Development Command, Cleveland, OH

(DA PROJ. 1L1-62209-AH-76)

(NASA-TP-2901; E-4144; NAS 1.60:2901; AVSCOM-TR-88-C-010) Avail: NTIS HC A03/MF A01 CSCL 13I

COMPUTER AIDED DESIGN, COMPUTER PROGRAMS, GEARS, MECHANICAL DRIVES

**N89-22891\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**ROTORDYNAMIC INSTABILITY PROBLEMS IN HIGH-PERFORMANCE TURBOMACHINERY, 1988**

Washington, DC Feb. 1989 454 p Workshop held in College Station, TX, 16-18 May 1988; sponsored by NASA, Lewis Research Center, Cleveland, OH, Texas A and M Univ., College Station, ARO, Durham, NC, and Aeropropulsion Lab., Wright-Patterson AFB, OH

(NASA-CP-3026; E-4227; NAS 1.55:3026) Avail: NTIS HC A20/MF A03 CSCL 13I

BEARINGS, COMPRESSORS, CONFERENCES, DAMPERS, DYNAMIC STABILITY, IMPELLERS, MATHEMATICAL MODELS, ROTOR AERODYNAMICS, SEALS (STOPPERS) TURBOMACHINERY

**N89-24607\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**COMPARISON OF PREDICTED AND MEASURED TEMPERATURES OF UH-60A HELICOPTER TRANSMISSION**

HAROLD H. COE Washington Apr. 1989 15 p

(NASA-TP-2911; NAS 1.60:2911; E-4588; AVSCOM-TR-89-C-010; AD-A219173) Avail: NTIS HC A03/MF A01 CSCL 13/9

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COMPUTERIZED SIMULATION, HELICOPTER PROPELLER DRIVE, OPERATING TEMPERATURE, PERFORMANCE TESTS, ROLLER BEARINGS, THERMAL ANALYSIS, TRANSMISSIONS (MACHINE ELEMENTS), UH-60A HELICOPTER

**N90-18740\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### FASTENER DESIGN MANUAL

RICHARD T. BARRETT Mar. 1990 99 p  
(NASA-RP-1228; E-4911; NAS 1.61:1228) Avail: NTIS HC A05/MF A01 CSCL 13K

This manual was written for design engineers to enable them to choose appropriate fasteners for their designs. Subject matter includes fastener material selection, platings, lubricants, corrosion, locking methods, washers, inserts, thread types and classes, fatigue loading, and fastener torque. A section on design criteria covers the derivation of torque formulas, loads on a fastener group, combining simultaneous shear and tension loads, pullout load for tapped holes, grip length, head styles, and fastener strengths. The second half of this manual presents general guidelines and selection criteria for rivets and lockbolts. Author

**N90-19593\*#** Illinois Univ., Chicago. Dept. of Mechanical Engineering.

### THEORY OF GEARING

FAYDOR L. LITVIN 1989 479 p Prepared in cooperation with Army Aviation Systems Command, Cleveland, OH (NAG3-783; NAG3-655; DA PROJ. 1L1-62209-AH-76) (NASA-RP-1212; E-2641; NAS 1.61:1212; AVSCOM-TR-88-C-035; L-89-600204) Avail: NTIS HC A21/MF A03; Also Avail: SOD HC \$40.00 as 033-000-01068-1 CSCL 13I

Basic mathematical problems on the theory of gearing are covered in this book, such as the necessary and sufficient conditions of envelope existence, relations between principal curvatures and directions for surfaces of mating gears. Also included are singularities of surfaces accompanied by undercutting the process of generation, the phenomena of envelope of lines of contact, and the principles for generation of conjugate surfaces. Special attention is given to the algorithms for computer aided simulation of meshing and tooth contact. This edition was complemented with the results of research recently performed by the author and his doctoral students. The book contains sample problems and also problems for the reader to solve. K.C.D.

**N90-19595\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### MODELING AND ANALYSIS OF THE SPACE SHUTTLE

#### NOSE-GEAR TIRE WITH SEMIANALYTIC FINITE ELEMENTS

KYUN O. KIM, AHMED K. NOOR (Joint Inst. for Advancement of Flight Sciences, Hampton, VA.), and JOHN A. TANNER Washington Apr. 1990 36 p  
(NASA-TP-2977; L-16639; NAS 1.60:2977) Avail: NTIS HC A03/MF A01 CSCL 22B

AIRCRAFT TIRES, ANISOTROPIC SHELLS, FINITE ELEMENT METHOD, LANDING GEAR, MATHEMATICAL MODELS, NOSE WHEELS, SHELL THEORY, SPACE SHUTTLE ORBITERS

**N90-28063\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### LIQUID LUBRICATION IN SPACE

ERWIN V. ZARETSKY Jul. 1990 26 p  
(NASA-RP-1240; E-5094; NAS 1.61:1240) Avail: NTIS HC A03/MF A01 CSCL 13I

The requirement for long-term, reliable operation of aerospace mechanisms has, with a few exceptions, pushed the state of the art in tribology. Space mission life requirements in the early 1960s were generally 6 months to a year. The proposed U.S. space station schedule to be launched in the 1990s must be continuously usable for 10 to 20 years. Liquid lubrication systems are generally used for mission life requirements longer than a year. Although most spacecraft or satellites have reached their required lifetimes without a lubrication-related failure, the application of liquid

lubricants in the space environment presents unique challenges. The state of the art of liquid lubrication in space as well as the problems and their solutions are reviewed. Author

**N90-28066\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

### MODIFICATION OF THE SHABERTH BEARING CODE TO INCORPORATE RP-1 AND A DISCUSSION OF THE TRACTION MODEL

CLAUDIA M. WOODS Sep. 1990 30 p  
(NASA-TP-3017; E-5407; NAS 1.60:3017) Avail: NTIS HC A03/MF A01 CSCL 13I

COMPUTER PROGRAMS, MATHEMATICAL MODELS, ROLLER BEARINGS, RP-1 ROCKET PROPELLANTS, SPACECRAFT LUBRICATION

## 38

### QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

**N87-27204\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### ELECTRONICS RELIABILITY AND MEASUREMENT TECHNOLOGY

JOSEPH S. HEYMAN, ed. Aug. 1987 143 p Conference held in Hampton, Va., 3-5 Jun. 1986; sponsored by NASA Langley Research Center, USAF, National Security Industrial Association, and the Aerospace Industry Association (NASA-CP-2472; L-16315; NAS 1.55:2472) Avail: NTIS HC A07/MF A01 CSCL 14D

COMPONENT RELIABILITY, INSPECTION, MICROELECTRONICS, NONDESTRUCTIVE TESTS, QUALITY CONTROL, RELIABILITY ENGINEERING

**N87-28025\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### A TECHNIQUE FOR EVALUATING THE APPLICATION OF THE PIN-LEVEL STUCK-AT FAULT MODEL TO VLSI CIRCUITS

DANIEL L. PALUMBO and GEORGE B. FINELLI Sep. 1987 45 p  
(NASA-TP-2738; L-16269; NAS 1.60:2738) Avail: NTIS HC A03/MF A01 CSCL 14D

COMPUTERS, ERROR ANALYSIS, EVALUATION, FAULT TOLERANCE, INTEGRATED CIRCUITS, VERY LARGE SCALE INTEGRATION

## 39

### STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

**N81-71592\*** National Aeronautics and Space Administration, Washington, DC.

### THE NASTRAN DEMONSTRATION PROBLEM MANUAL, LEVEL 17.5

Dec. 1978 185 p refs  
(NASA-SP-224(05))

**N81-71594\*** National Aeronautics and Space Administration, Washington, DC.

### THE NASTRAN PROGRAMMERS MANUAL, LEVEL 17.5



Dec. 1978 845 p refs  
(NASA-SP-223(05))

**N87-11180\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**TURBINE ENGINE HOT SECTION TECHNOLOGY, 1984**  
Oct. 1984 400 p Conference held in Cleveland, Ohio, 23-24 Oct. 1984  
(NASA-CP-2339; E-2267; NAS 1.55:2339) Avail: NTIS HC A17/MF A03 CSCL 20K  
AIRCRAFT ENGINES, AIRFOILS, CONFERENCES, LIFE (DURABILITY), LININGS, MATHEMATICAL MODELS, PREDICTION ANALYSIS TECHNIQUES, ROTOR BLADES (TURBOMACHINERY), TURBINE ENGINES

**N87-12921\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.  
**EFFECTS OF VARIABLES UPON PYROTECHNICALLY INDUCED SHOCK RESPONSE SPECTRA**  
J. L. SMITH May 1986 61 p  
(NASA-TP-2603; NAS 1.60:2603) Avail: NTIS HC A04/MF A01 CSCL 20K  
PYROTECHNICS, SHOCK LOADS, SHOCK SPECTRA, VARIABILITY

**N87-13789\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EFFECTS OF WINGLET ON TRANSONIC FLUTTER CHARACTERISTICS OF A CANTILEVERED TWIN-ENGINE-TRANSPORT WING MODEL**  
C. L. RUHLIN, K. G. BHATIA (Boeing Commercial Airplane Co., Seattle, Wash.), and K. S. NAGARAJA Dec. 1986 77 p  
(NASA-TP-2627; L-16095; NAS 1.60:2627) Avail: NTIS HC A05/MF A01 CSCL 20K  
AERODYNAMIC CONFIGURATIONS, FLUTTER, PREDICTION ANALYSIS TECHNIQUES, TRANSONIC FLOW, WIND TUNNEL TESTS, WINGLETS, WINGS

**N87-16321\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**THE 20TH AEROSPACE MECHANICS SYMPOSIUM**  
May 1986 316 p Symposium held in Cleveland, Ohio, 7-9 May 1986; sponsored by NASA, the California Inst. of Tech. and LMSC  
(NASA-CP-2423-REV; E-2904; NAS 1.55:2423-REV) Avail: NTIS HC A14/MF A02 CSCL 20K  
ACTUATORS, CONFERENCES, FLEXIBLE SPACECRAFT, HYDRAULIC EQUIPMENT, JOINTS (JUNCTIONS), MANIPULATORS, SPACE STATIONS, SPACECRAFT INSTRUMENTS, SPUTTERING, TRIBOLOGY

**N87-18855\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**SENSITIVITY ANALYSIS IN ENGINEERING**  
HOWARD M. ADELMAN, comp. and RAPHAEL T. HAFTKA, comp. (Virginia Polytechnic Inst. and State Univ., Blacksburg) Feb. 1987 369 p Symposium held in Hampton, Va., 25-26 Sep. 1986  
(NASA-CP-2457; L-16278; NAS 1.55:2457) Avail: NTIS HC A16/MF A03 CSCL 20K  
DYNAMIC STRUCTURAL ANALYSIS, EIGENVALUES, MODAL RESPONSE, OPTIMIZATION, SENSITIVITY

**N87-20566\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**SHOT PEENING FOR Ti-6Al-4V ALLOY COMPRESSOR BLADES**  
GERALD A. CAREK Apr. 1987 9 p  
(NASA-TP-2711; E-3430; NAS 1.60:2711) Avail: NTIS HC A02/MF A01 CSCL 20K  
ALUMINUM, COMPRESSOR BLADES, SHOT PEENING, TITANIUM ALLOYS, VANADIUM

**N87-20567\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**MODELING OF JOINTS FOR THE DYNAMIC ANALYSIS OF TRUSS STRUCTURES**  
W. KEITH BELVIN May 1987 43 p  
(NASA-TP-2661; L-16163; NAS 1.60:2661) Avail: NTIS HC A03/MF A01 CSCL 20K  
DYNAMIC STRUCTURAL ANALYSIS, JOINTS (JUNCTIONS), LARGE SPACE STRUCTURES, MODELS, TRUSSES

**N87-20568\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.  
**SPACE STATION STRUCTURES AND DYNAMICS TEST PROGRAM**  
CARLETON J. MOORE, JOHN S. TOWNSEND, and EDWARD W. IVEY Mar. 1987 47 p  
(NASA-TP-2710; NAS 1.60:2710) Avail: NTIS HC A03/MF A01 CSCL 20K  
DYNAMIC STRUCTURAL ANALYSIS, DYNAMIC TESTS, LARGE SPACE STRUCTURES, SPACE STATION STRUCTURES, SPACE STATIONS, SYSTEMS ANALYSIS

**N87-27231\*#** Computer Software Management and Information Center, Athens, GA.  
**FIFTEENTH NASTRAN (R) USERS' COLLOQUIUM**  
Aug. 1987 312 p Colloquium held in Kansas City, Mo., 4-8 May 1987  
(NASW-3247)  
(NASA-CP-2481; NAS 1.55:2481; AD-A226753) Avail: NTIS HC A14/MF A02; also available from COSMIC, Athens, Ga. 30602 CSCL 20/11  
COMPUTER AIDED DESIGN, COMPUTER TECHNIQUES, CONFERENCES, FINITE ELEMENT METHOD, NASTRAN, STRUCTURAL ANALYSIS, STRUCTURAL VIBRATION

**N87-29858\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.  
**THE 21ST AEROSPACE MECHANISMS SYMPOSIUM**  
May 1987 356 p Symposium held in Houston, Tex., 29 Apr. - 1 May 1987; sponsored by NASA, California Inst. of Tech., and LMSC  
(NASA-CP-2470; S-560; NAS 1.55:2470) Avail: NTIS HC A16/MF A02 CSCL 20K  
ACTUATORS, DEPLOYMENT, LARGE SPACE STRUCTURES, MANIPULATORS, ROBOTICS, SPACE ERECTABLE STRUCTURES

**N88-11140\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**TURBINE ENGINE HOT SECTION TECHNOLOGY, 1985**  
Oct. 1985 443 p Conference held in Cleveland, Ohio, 22-23 Oct. 1985  
(NASA-CP-2405; E-2727; NAS 1.55:2405) Avail: NTIS HC A19/MF A03 CSCL 20K  
COMBUSTION CHAMBERS, CONFERENCES, GAS TURBINE ENGINES, LININGS, MATHEMATICAL MODELS, METAL FATIGUE, STRUCTURAL ANALYSIS, TURBINE BLADES, VANES

**N88-13609\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.  
**THE 58TH SHOCK AND VIBRATION SYMPOSIUM, VOLUME 1**  
WALTER D. PILKEY, comp. and BARBARA F. PILKEY, comp. (Virginia Univ., Charlottesville.) Oct. 1987 476 p Symposium held in Huntsville, Ala., 13-15 Oct. 1987; sponsored in part by DOD  
(NASA-CP-2488-VOL-1; M-571-VOL-1; NAS 1.55:2488-VOL-1) Avail: NTIS HC A21/MF A03 CSCL 20K  
CONFERENCES, DYNAMIC STRUCTURAL ANALYSIS, MECHANICAL SHOCK, SHOCK TESTS, SPACE SHUTTLE MAIN ENGINE, STRUCTURAL VIBRATION, VIBRATION DAMPING, VIBRATION ISOLATORS

## 39 STRUCTURAL MECHANICS

**N88-15263\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**LIFE PREDICTION OF THERMOMECHANICAL FATIGUE USING TOTAL STRAIN VERSION OF STRAINRANGE PARTITIONING (SRP): A PROPOSAL**

JAMES F. SALTSMAN and GARY R. HALFORD Feb. 1988 25 p

(NASA-TP-2779; E-3795; NAS 1.60:2779) Avail: NTIS HC A03/MF A01 CSCL 20K

FATIGUE LIFE, LIFE (DURABILITY), METALS, PREDICTIONS

**N88-17095\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**STRESS INTENSITY AND CRACK DISPLACEMENT FOR SMALL EDGE CRACKS**

THOMAS W. ORANGE Feb. 1988 11 p

(NASA-TP-2801; E-3744; NAS 1.60:2801) Avail: NTIS HC A03/MF A01 CSCL 20K

CRACKS, DISPLACEMENT, EDGES, ELASTIC DEFORMATION, STRESS INTENSITY FACTORS

**N88-18948\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**THE 58TH SHOCK AND VIBRATION SYMPOSIUM, VOLUME 2**

WALTER D. PILKEY, comp. and BARBARA F. PILKEY, comp. (Virginia Univ., Charlottesville.) Feb. 1988 208 p Symposium held in Huntsville, Ala., 13-15 Oct. 1987; sponsored in part by DOD

(NASA-CP-2488-VOL-2; M-572-VOL-2; NAS 1.55:2488-VOL-2)

Avail: NTIS HC A10/MF A02 CSCL 20K

CONFERENCES, DYNAMIC STRUCTURAL ANALYSIS, FINITE ELEMENT METHOD, SPACECRAFT COMPONENTS, SPACECRAFT DESIGN, SPECTRUM ANALYSIS, STRUCTURAL VIBRATION

**N88-20652\*#** Computer Software Management and Information Center, Athens, GA.

**SIXTEENTH NASTRAN (R) USERS' COLLOQUIUM**

Mar. 1988 196 p Colloquium held in Arlington, Va., 25-29 Apr. 1988

(NASA-CP-2505; NAS 1.55:2505; AD-A226754) Avail: NTIS HC

A09/MF A02; also available from COSMIC, Athens, Ga. 30602 CSCL 20/11

CONFERENCES, NASTRAN, STRUCTURAL ANALYSIS

**N88-21456\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ADVANCES IN CONTACT ALGORITHMS AND THEIR APPLICATION TO TIRES**

AHMED K. NOOR and JOHN A. TANNER Apr. 1988 36 p Presented at the American Chemical Society Meeting, Montreal, Quebec, 26-29 May 1987 Original contains color illustrations

(NASA-TP-2781; L-16376; NAS 1.60:2781) Avail: NTIS HC

A03/MF A01 CSCL 20K

ALGORITHMS, FRICTION, SURFACE PROPERTIES, TIRES

**N88-21468\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**THE 22ND AEROSPACE MECHANISMS SYMPOSIUM**

May 1988 416 p Symposium held in Hampton, Va.; sponsored by NASA, Washington, California Inst. of Tech., Pasadena, and LMSC, Sunnyvale, Calif.

(NASA-CP-2506; L-16433; NAS 1.55:2506) Avail: NTIS HC

A18/MF A03 CSCL 20K

ACTUATORS, BEARINGS, MAGNETIC SUSPENSION, MECHANICAL DRIVES, TELEOPERATORS, VIBRATION ISOLATORS

**N88-21498\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**NONLINEAR CONSTITUTIVE RELATIONS FOR HIGH TEMPERATURE APPLICATIONS, 1986**

Apr. 1988 482 p Symposium held in Akron, Ohio, 11-13 Jun. 1986; sponsored by NASA, Lewis Research Center, Cleveland,

Ohio and Akron Univ., Ohio

(NASA-CP-10010; E-3956; NAS 1.55:10010) Avail: NTIS HC A21/MF A03 CSCL 20K

CONSTITUTIVE EQUATIONS, MATHEMATICAL MODELS, REFRACTORY MATERIALS, STRESS ANALYSIS, STRUCTURAL ANALYSIS, VISCOPLASTICITY

**N88-22382\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**LEWIS STRUCTURES TECHNOLOGY, 1988. VOLUME 2: STRUCTURAL MECHANICS**

May 1988 307 p Symposium held in Cleveland, Ohio, 24-25 May 1988

(NASA-CP-3003-VOL-2; E-3970-VOL-2; NAS 1.55:3003-VOL-2)

Avail: NTIS HC A14/MF A02 CSCL 20K

AIRCRAFT ENGINES, DYNAMIC STRUCTURAL ANALYSIS, FATIGUE (MATERIALS), FRACTURE MECHANICS, STRESS ANALYSIS

**N88-22408\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**LEWIS STRUCTURES TECHNOLOGY, 1988. VOLUME 3: STRUCTURAL INTEGRITY FATIGUE AND FRACTURE WIND TURBINES HOST**

May 1988 366 p Symposium held in Cleveland, Ohio, 24-25 May 1988

(NASA-CP-3003-VOL-3; E-3970-VOL-3; NAS 1.55:3003-VOL-3)

Avail: NTIS HC A16/MF A03 CSCL 20K

CONFERENCES, DYNAMIC STRUCTURAL ANALYSIS, FRACTURE MECHANICS, METAL FATIGUE, NONDESTRUCTIVE TESTS, PARALLEL PROCESSING (COMPUTERS), WIND TURBINES

**N88-23226\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

**LEWIS STRUCTURES TECHNOLOGY, 1988. VOLUME 1: STRUCTURAL DYNAMICS**

May 1988 463 p Symposium held in Cleveland, Ohio, 24-25 May 1988

(NASA-CP-3003-VOL-1; E-3970-VOL-1; NAS 1.55:3003-VOL-1)

Avail: NTIS HC A20/MF A03 CSCL 20K

AEROELASTICITY, COMPUTER TECHNIQUES, CONFERENCES, DYNAMIC STRUCTURAL ANALYSIS, NASTRAN, PARALLEL PROCESSING (COMPUTERS), SPACECRAFT STRUCTURES, STRUCTURAL VIBRATION, TURBINE BLADES, VIBRATION DAMPING, WIND TURBINES

**N88-23988\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**DYNAMIC CHARACTERISTICS OF A VIBRATING BEAM WITH PERIODIC VARIATION IN BENDING STIFFNESS**

JOHN S. TOWNSEND Feb. 1987 23 p Previously announced as N87-22726

(NASA-TP-2697; NAS 1.60:2697) Avail: NTIS HC A03/MF A01

CSCL 20K

BEAMS (SUPPORTS), BENDING, BENDING VIBRATION, DYNAMIC CHARACTERISTICS, MODAL RESPONSE, MODULATION, PERIODIC VARIATIONS, STIFFNESS

**N88-25013\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**SRM PROPELLANT AND POLYMER MATERIALS STRUCTURAL TEST PROGRAM**

CARLETON J. MOORE May 1988 16 p

(NASA-TP-2821; NAS 1.60:2821) Avail: NTIS HC A03/MF A01

CSCL 20K

DYNAMIC STRUCTURAL ANALYSIS, PERFORMANCE TESTS, SOLID PROPELLANT ROCKET ENGINES, SPACE SHUTTLE BOOSTERS

**N88-26684\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**THREE-DIMENSIONAL ANALYSIS OF A POSTBUCKLED EMBEDDED DELAMINATION**

JOHN D. WHITCOMB Jul. 1988 26 p  
(NASA-TP-2823; L-16453; NAS 1.60:2823) Avail: NTIS HC  
A03/MF A01 CSCL 20K

BUCKLING, DELAMINATING, FINITE ELEMENT METHOD,  
LAMINATES, STRAIN ENERGY RELEASE RATE

**N88-28343\*#** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, AL.

**SRM (SOLID ROCKET MOTOR) PROPELLANT AND POLYMER  
MATERIALS STRUCTURAL MODELING**

CARLETON J. MOORE Aug. 1988 42 p  
(NASA-TP-2824; NAS 1.60:2824) Avail: NTIS HC A03/MF A01  
CSCL 20K

POLYMERIC FILMS, PROPELLANTS, SOLID PROPELLANT  
ROCKET ENGINES, STRUCTURAL ANALYSIS

**N89-12876\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**TURBINE ENGINE HOT SECTION TECHNOLOGY 1986**

Oct. 1986 488 p Workshop held in Cleveland, Ohio, 21-22  
Oct. 1986

(NASA-CP-2444; E-3205; NAS 1.55:2444) Avail: NTIS HC  
A21/MF A03 CSCL 20K

CONFERENCES, FATIGUE (MATERIALS), FRACTURE  
MECHANICS, GAS TURBINE ENGINES, HEAT TRANSFER,  
MEASURING INSTRUMENTS, PROPELLANT COMBUSTION,  
STRUCTURAL ANALYSIS, THERMAL CONTROL COATINGS

**N89-13814\*#** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, AL.

**EFFECTS OF VARIABLES UPON PYROTECHNICALLY  
INDUCED SHOCK RESPONSE SPECTRA, PART 2**

JAMES LEE SMITH Nov. 1988 106 p  
(NASA-TP-2872; NAS 1.60:2872) Avail: NTIS HC A06/MF A01  
CSCL 20K

COMPONENT RELIABILITY, JOINTS (JUNCTIONS),  
PYROTECHNICS, SHAPED CHARGES, SPACECRAFT  
STRUCTURES

**N89-16170\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**PARTITIONING STRATEGY FOR EFFICIENT NONLINEAR  
FINITE ELEMENT DYNAMIC ANALYSIS ON  
MULTIPROCESSOR COMPUTERS**

AHMED K. NOOR and JEANNE M. PETERS (Joint Inst. for  
Advancement of Flight Sciences, Hampton, VA.) Washington,  
DC Jan. 1989 38 p Original contains color illustrations  
(NAG1-730; AF-AFOSR-0136-88)

(NASA-TP-2850; L-16476; NAS 1.60:2850) Avail: NTIS HC  
A03/MF A01 CSCL 20K

DYNAMIC STRUCTURAL ANALYSIS, FINITE ELEMENT  
METHOD, MULTIPROCESSING (COMPUTERS), PARALLEL  
PROCESSING (COMPUTERS), PARTITIONS (MATHEMATICS)

**N89-16183\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**THERMOVISCOPLASTIC MODEL WITH APPLICATION TO  
COPPER**

ALAN D. FREED Dec. 1988 18 p  
(NASA-TP-2845; E-4280; NAS 1.60:2845) Avail: NTIS HC  
A03/MF A01 CSCL 20K

COPPER, MODELS, THERMOVISCOELASTICITY, VISCO-  
PLASTICITY

**N89-16192\*#** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, AL.

**CYCLIC LOADS TESTS OF CARBON INVOLUTE SOLID  
ROCKET MOTOR OUTER BOOT RING SEGMENTS**

RAFIQ AHMED Dec. 1988 28 p  
(NASA-TP-2884; M-605; NAS 1.60:2884) Avail: NTIS HC  
A03/MF A01 CSCL 20K

CYCLIC LOADS, FIBER COMPOSITES, LOAD TESTS,  
MODULUS OF ELASTICITY, PLASTIC PROPERTIES, RESIN

MATRIX COMPOSITES, SPACE SHUTTLE BOOSTERS,  
STRESS-STRAIN RELATIONSHIPS

**N89-16196\*#** National Aeronautics and Space Administration.  
Hugh L. Dryden Flight Research Facility, Edwards, CA.

**CONTROL SURFACE SPANWISE PLACEMENT IN ACTIVE  
FLUTTER SUPPRESSION SYSTEMS**

E. NISSIM and JOHN J. BURKEN Nov. 1988 19 p Prepared  
in cooperation with Technion - Israel Inst. of Tech., Haifa  
(NASA-TP-2873; H-1492; NAS 1.60:2873) Avail: NTIS HC  
A03/MF A01 CSCL 20K

ACTIVE CONTROL, CONTROL SURFACES, FLUTTER  
ANALYSIS

**N89-17298\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

**TURBINE ENGINE HOT SECTION TECHNOLOGY, 1987**

Oct. 1987 464 p Workshop held in Cleveland, OH, 20-21 Oct.  
1987

(NASA-CP-2493; E-3745; NAS 1.55:2493) Avail: NTIS HC  
A20/MF A03 CSCL 20K

AIRCRAFT ENGINES, COMBUSTION, CONFERENCES, FINITE  
ELEMENT METHOD, FRACTURE MECHANICS, GAS TURBINE  
ENGINES, HEAT TRANSFER, STRUCTURAL ANALYSIS,  
THERMAL CONTROL COATINGS, THERMAL FATIGUE, TURBINE  
BLADES

**N89-17892\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**MEASURED AND PREDICTED ROOT-MEAN-SQUARE ERRORS  
IN SQUARE AND TRIANGULAR ANTENNA MESH FACETS**

W. B. FICHTER Washington, DC Mar. 1989 17 p  
(NASA-TP-2896; L-16525; NAS 1.60:2896) Avail: NTIS HC  
A03/MF A01 CSCL 20K

ANTENNA DESIGN, ANTENNA RADIATION PATTERNS,  
FABRICS, REFLECTORS, ROOT-MEAN-SQUARE ERRORS,  
STRUCTURAL ANALYSIS

**N89-19579\*#** National Aeronautics and Space Administration,  
Washington, DC.

**MIXED FINITE ELEMENT MODELS FOR FREE VIBRATIONS  
OF THIN-WALLED BEAMS**

AHMED K. NOOR, JEANNE M. PETERS, and BYUNG-JIN MIN  
Feb. 1989 28 p Prepared in cooperation with Joint Inst. for  
Advancement of Flight Sciences, Hampton, VA

(NASA-TP-2868; L-16506; NAS 1.60:2868) Avail: NTIS HC  
A03/MF A01 CSCL 20K

BEAMS (SUPPORTS), FINITE ELEMENT METHOD, FREE  
VIBRATION, THIN WALLS

**N89-19580\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

**MIXED FORMULATION FOR FRICTIONLESS CONTACT  
PROBLEMS**

AHMED K. NOOR and KYUN O. KIM 1989 26 p Prepared in  
cooperation with George Washington Univ., Hampton, VA and Joint  
Inst. for Advancement of Flight Sciences, Hampton, VA

(NASA-TP-2897; L-16513; NAS 1.60:2897) Avail: NTIS HC  
A03/MF A01 CSCL 20K

CONTACT LOADS, CURVED BEAMS, DEFORMATION, FINITE  
ELEMENT METHOD, FRICTION FACTOR, STRESS ANALYSIS

**N89-22940\*#** Computer Software Management and Information  
Center, Athens, GA.

**SEVENTEENTH NASTRAN (R) USERS' COLLOQUIUM**

Mar. 1989 400 p Colloquium held in San Antonio, TX, 24-28  
Apr. 1989

(NASA-CP-3029; NAS 1.55:3029; AD-A226755) Avail: NTIS HC  
A17/MF A03; also available from COSMIC, Athens, GA 30602  
CSCL 20/11

CONFERENCES, FINITE ELEMENT METHOD, NASTRAN,  
STRAIN ENERGY METHODS, STRUCTURAL ANALYSIS

## 39 STRUCTURAL MECHANICS

**N89-23892\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### THE 23RD AEROSPACE MECHANISMS SYMPOSIUM

Washington Mar. 1989 342 p Symposium held in Huntsville, AL, 3-5 May 1989; sponsored by NASA, Washington, California Inst. of Tech., Pasadena, and LMSC, Sunnyvale, CA (NASA-CP-3032; M-611; NAS 1.55:3032) Avail: NTIS HC A15/MF A02 CSCL 20K

AEROSPACE SYSTEMS, CONFERENCES, DEPLOYMENT, LUBRICANTS, MANIPULATORS, SPACE STATIONS, SPACECRAFT DOCKING, TELEOPERATORS

**N89-24626\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### RESEARCH IN STRUCTURES, STRUCTURAL DYNAMICS AND MATERIALS, 1989

WILLIAM F. HUNTER, comp. and AHMED K. NOOR, comp. (George Washington Univ., Hampton, VA.) Apr. 1989 88 p Proceedings of the AIAA/ASME/ASCE/AHS/ASC 30th Structures, Structural Dynamics and Materials Conference, Mobile, AL, 3-5 Apr. 1989

(NASA-CP-10024; NAS 1.55:10024) Avail: NTIS HC A05/MF A01 CSCL 20K

ACOUSTIC EMISSION, BUCKLING, COMPOSITE STRUCTURES, CONFERENCES, CONTROL SYSTEMS DESIGN, DISPLACEMENT, DYNAMIC STRUCTURAL ANALYSIS, MATHEMATICAL MODELS

**N89-24638\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### COMPUTATIONAL METHODS FOR STRUCTURAL MECHANICS AND DYNAMICS, PART 1

W. JEFFERSON STROUD, ed., JERROLD M. HOUSNER, ed., JOHN A. TANNER, ed., and ROBERT J. HAYDUK, ed. Washington May 1989 329 p Workshop held in Hampton, VA, 19-21 Jun. 1985

(NASA-CP-3034-PT-1; L-16560-PT-1; NAS 1.55:3034-PT-1) Avail: NTIS HC A15/MF A02 CSCL 20K

COMPUTATION, COMPUTERIZED SIMULATION, CONFERENCES, SHELLS (STRUCTURAL FORMS), STRESS ANALYSIS, STRUCTURAL ANALYSIS, TIRES

**N89-24654\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### COMPUTATIONAL METHODS FOR STRUCTURAL MECHANICS AND DYNAMICS

W. JEFFERSON STROUD, ed., JERROLD M. HOUSNER, ed., JOHN A. TANNER, ed., and ROBERT J. HAYDUK, ed. Washington May 1989 256 p Workshop held in Hampton, VA, 19-21 Jun. 1985

(NASA-CP-3034-PT-2; L-16560-PT-2; NAS 1.55:3034-PT-2) Avail: NTIS HC A12/MF A02 CSCL 20K

AIRCRAFT DESIGN, COMPUTERIZED SIMULATION, CONFERENCES, DYNAMIC STRUCTURAL ANALYSIS, MANY BODY PROBLEM, STRESS ANALYSIS

**N89-26255\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### DERIVATION OF A TAPERED P-VERSION BEAM FINITE ELEMENT

HOWARD E. HINNANT (Army Aviation Systems Command, Hampton, VA.) Aug. 1989 45 p

(DA PROJ. 1L1-62211-A-47-AB)

(NASA-TP-2931; L-16577; NAS 1.60:2931; AVSCOM-TR-B-002; AD-A213443) Avail: NTIS HC A03/MF A01 CSCL 20/11

BEAMS, FINITE ELEMENT METHOD, MATHEMATICAL MODELS, TAPERING

**N89-27214\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### WELD STRESSES BEYOND ELASTIC LIMIT: MATERIALS DISCONTINUITY

V. VERDERAIME Washington Aug. 1989 28 p (NASA-TP-2935; NAS 1.60:2935) Avail: NTIS HC A03/MF A01 CSCL 20L

ELASTIC PROPERTIES, STRAIN HARDENING, STRESS CONCENTRATION, STRESSES, WELDING

**N89-28034\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### EVALUATION OF A STRAIN-GAGE LOAD CALIBRATION ON A LOW-ASPECT-RATIO WING STRUCTURE AT ELEVATED TEMPERATURE

LAWRENCE F. REARDON Jun. 1989 39 p

(NASA-TP-2921; H-1331; NAS 1.60:2921) Avail: NTIS HC A03/MF A01 CSCL 20K

AIRCRAFT CONFIGURATIONS, AIRCRAFT STRUCTURES, CALIBRATING, HIGH TEMPERATURE ENVIRONMENTS, LOAD TESTS, LOW ASPECT RATIO WINGS, STRAIN GAGES, WING LOADING

**N89-29773\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### NASA WORKSHOP ON COMPUTATIONAL STRUCTURAL MECHANICS 1987, PART 1

NANCY P. SYKES, ed. (Analytical Services and Materials, Inc., Hampton, VA.) Feb. 1989 383 p Workshop held in Hampton, VA, 18-20 Nov. 1987; sponsored by NASA, Langley Research Center, Hampton, VA, and NASA, Lewis Research Center, Cleveland, OH

(NASA-CP-10012-PT-1; NAS 1.55:10012-PT-1) Avail: NTIS HC A17/MF A03 CSCL 20K

ARCHITECTURE (COMPUTERS), CONFERENCES, FINITE ELEMENT METHOD, MULTIPROCESSING (COMPUTERS), PARALLEL PROCESSING (COMPUTERS), SOFTWARE ENGINEERING, STRUCTURAL ANALYSIS

**N89-29789\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### NASA WORKSHOP ON COMPUTATIONAL STRUCTURAL MECHANICS 1987, PART 2

NANCY P. SYKES, ed. (Analytical Services and Materials, Inc., Hampton, VA.) Feb. 1989 374 p Workshop held in Hampton, VA, 18-20 Nov. 1987; sponsored by NASA, Langley Research Center, Hampton, VA, and NASA, Lewis Research Center, Cleveland, OH

(NASA-CP-10012-PT-2; NAS 1.55:10012-PT-2) Avail: NTIS HC A16/MF A02 CSCL 20K

ARCHITECTURE (COMPUTERS), COMPUTER AIDED DESIGN, COMPUTER SYSTEMS PROGRAMS, COMPUTERIZED SIMULATION, CONFERENCES, FINITE ELEMENT METHOD, STRUCTURAL ANALYSIS, STRUCTURAL ENGINEERING

**N89-29799\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### NASA WORKSHOP ON COMPUTATIONAL STRUCTURAL MECHANICS 1987, PART 3

NANCY P. SYKES, ed. (Analytical Services and Materials, Inc., Hampton, VA.) Feb. 1989 419 p Workshop held in Hampton, VA, 18-20 Nov. 1987; sponsored by NASA, Langley Research Center, Hampton, VA, and NASA, Lewis Research Center, Cleveland, OH

(NASA-CP-10012-PT-3; NAS 1.55:10012-PT-3) Avail: NTIS HC A18/MF A03 CSCL 20K

COMPUTER TECHNIQUES, CONFERENCES, FINITE ELEMENT METHOD, LARGE SPACE STRUCTURES, SOFTWARE ENGINEERING, STRUCTURAL ANALYSIS

**N89-29811\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### APPLICATION OF NEWTON'S METHOD TO THE POSTBUCKLING OF RINGS UNDER PRESSURE LOADINGS

GAYLEN A. THURSTON Oct. 1989 26 p

(NASA-TP-2941; L-16578; NAS 1.60:2941) Avail: NTIS HC A03/MF A01 CSCL 20K

BUCKLING, CYLINDRICAL SHELLS, DEFORMATION, LOADS (FORCES), NEWTON METHODS, RING STRUCTURES, STRUCTURAL FAILURE

**N90-12042\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.  
**EFFECT OF CONTROL SURFACE MASS UNBALANCE ON THE STABILITY OF A CLOSED-LOOP ACTIVE CONTROL SYSTEM**  
 E. NISSIM (Technion - Israel Inst. of Tech., Haifa.) Oct. 1989 26 p  
 (NASA-TP-2952; H-1534; NAS 1.60:2952) Avail: NTIS HC A03/MF A01 CSCL 20K  
 ACTIVE CONTROL, AERODYNAMIC STABILITY, AERODYNAMICS, BALANCE, CONTROL SURFACES, FEEDBACK CONTROL, FLUTTER, INERTIA, MASS DISTRIBUTION

**N90-18081\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**INTEGRATED FORCE METHOD VERSUS DISPLACEMENT METHOD FOR FINITE ELEMENT ANALYSIS**  
 SURYA N. PATNAIK, LASZLO BERKE, and RICHARD H. GALLAGHER (Clarkson Univ., Potsdam, NY.) Washington Feb. 1990 33 p  
 (NASA-TP-2937; E-4604; NAS 1.60:2937) Avail: NTIS HC A03/MF A01 CSCL 20K  
 DISPLACEMENT, EQUILIBRIUM EQUATIONS, FINITE ELEMENT METHOD, LOADS (FORCES), STIFFNESS, STRUCTURAL ANALYSIS, STRUCTURAL STABILITY

**N90-22079\*#** National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.  
**THE 24TH AEROSPACE MECHANISMS SYMPOSIUM**  
 Washington Apr. 1990 370 p Symposium held at Kennedy Space Center, FL, 18-20 Apr. 1990; sponsored by NASA, Washington, California Inst. of Tech., Pasadena, and LMSC, Sunnyvale, CA  
 (NASA-CP-3062; NAS 1.55:3062) Avail: NTIS HC A16/MF A03 CSCL 20K  
 ACTUATORS, AEROSPACE ENGINEERING, CONFERENCES, GROUND SUPPORT EQUIPMENT, LARGE SPACE STRUCTURES, TRIBOLOGY

**N90-24637\*#** Computer Software Management and Information Center, Athens, GA.  
**EIGHTEENTH NASTRAN (R) USERS' COLLOQUIUM**  
 Washington NASA Apr. 1990 176 p Colloquium held in Portland, OR, 23-27 Apr. 1990 Sponsored by NASA, Washington  
 (NASA-CP-3069; NAS 1.55:3069; AD-A226756) Avail: NTIS HC A09/MF A01; also available from COSMIC, Athens, GA 30602 CSCL 20/11  
 CONFERENCES, FINITE ELEMENT METHOD, NASTRAN, STRUCTURAL ANALYSIS, STRUCTURAL VIBRATION

**N90-25366\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.  
**LOADS ANALYSIS AND TESTING OF FLIGHT CONFIGURATION SOLID ROCKET MOTOR OUTER BOOT RING SEGMENTS**  
 RAFIQ AHMED Washington Jun. 1990 47 p  
 (NASA-TP-3028; NAS 1.60:3028) Avail: NTIS HC A03/MF A01 CSCL 20K  
 BEAMS (SUPPORTS), BENDING, COMPUTER PROGRAMS, FAILURE ANALYSIS, MATHEMATICAL MODELS, SOLID PROPELLANT ROCKET ENGINES, STIFFNESS

**N90-27121\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**MODAL INTERACTION IN POSTBUCKLED PLATES. THEORY**  
 GAYLEN A. THURSTON Washington Nov. 1989 21 p  
 (NASA-TP-2943; L-16573; NAS 1.60:2943) Avail: NTIS HC A03/MF A01 CSCL 20K  
 BUCKLING, FAILURE MODES, PLATES (STRUCTURAL MEMBERS), STRUCTURAL ANALYSIS, STRUCTURAL FAILURE

**N90-28099\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**CERAMICS ANALYSIS AND RELIABILITY EVALUATION OF STRUCTURES (CARES). USERS AND PROGRAMMERS MANUAL**  
 NOEL N. NEMETH (Aerospace Design and Fabrication, Inc., Brook Park, OH.), JANE M. MANDERSCHIED, and JOHN P. GYEKENYESI Washington Aug. 1990 232 p  
 (NASA-TP-2916; E-4722-1; NAS 1.60:2916) Avail: NTIS HC A11/MF A02 CSCL 11C  
 CERAMICS, COMPUTER PROGRAMS, FAILURE MODES, NASTRAN, PROBABILITY THEORY, RELIABILITY ANALYSIS, STRUCTURAL ANALYSIS

**N90-28859\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**BUCKLING AND POSTBUCKLING BEHAVIOR OF COMPRESSION-LOADED ISOTROPIC PLATES WITH CUTOUTS**  
 MICHAEL P. NEMETH Washington Sep. 1990 22 p Presented at the 31st AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Long Beach, CA, 2-4 Apr. 1990 Previously announced in IAA as A90-29311  
 (NASA-TP-3024; L-16789; NAS 1.60:3024) Avail: NTIS HC A03/MF A01 CSCL 20K  
 BUCKLING, METAL PLATES, OPENINGS, RECTANGULAR PLATES, STIFFNESS

## 42

## GEOSCIENCES (GENERAL)

**N87-18139\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**GEOMORPHOLOGY FROM SPACE: A GLOBAL OVERVIEW OF REGIONAL LANDFORMS**  
 NICHOLAS M. SHORT, ed. and ROBERT W. BLAIR, JR., ed. (Fort Lewis A&M Coll., Durango, Colo.) 1986 737 p Original contains color illustrations  
 (NASA-SP-486; NAS 1.21:486; LC-86-17974) Avail: SOD HC \$41.00 as 033-000-00994-1; NTIS MF E03 CSCL 08E

This book, *Geomorphology from Space: A Global Overview of Regional Landforms*, was published by NASA STIF as a successor to the two earlier works on the same subject: *Mission to Earth: LANDSAT views the Earth*, and *ERTS-1: A New Window on Our Planet*. The purpose of the book is threefold: first, to serve as a stimulant in rekindling interest in descriptive geomorphology and landforms analysis at the regional scale; second, to introduce the community of geologists, geographers, and others who analyze the Earth's surficial forms to the practical value of space-acquired remotely sensed data in carrying out their research and applications; and third, to foster more scientific collaboration between geomorphologists who are studying the Earth's landforms and astrogeologists who analyze landforms on other planets and moons in the solar system, thereby strengthening the growing field of comparative planetology. F.M.R.

**N88-13774\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**SCIENTIFIC AND OPERATIONAL REQUIREMENTS FOR TOMS DATA**  
 ARLIN J. KRUEGER, ed. Dec. 1987 112 p Conference held in Greenbelt, Md., 10-11 Sep. 1986  
 (NASA-CP-2497; REPT-87B0206; NAS 1.55:2497) Avail: NTIS HC A06/MF A01 CSCL 04A  
 ATMOSPHERIC CHEMISTRY, CONFERENCES, MAPPING, OZONE DEPLETION, OZONOMETRY, PHOTOCHEMICAL

## 42 GEOSCIENCES (GENERAL)

### REACTIONS, SATELLITE SOUNDING, TOTAL OZONE MAPPING SPECTROMETER, TROPOSPHERE

**N88-17096\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

#### **NIMBUS 7 SOLAR BACKSCATTER ULTRAVIOLET (SBUV) SPECTRAL SCAN SOLAR IRRADIANCE AND EARTH RADIANCE PRODUCT USER'S GUIDE**

BARRY M. SCHLESINGER, RICHARD P. CEBULA (ST Systems Corp., Hyattsville, Md.), DONALD F. HEATH, and ALBERT J. FLEIG Feb. 1988 65 p (NAS5-29386)

(NASA-RP-1199; NAS 1.61:1199; REPT-88-0004) Avail: NTIS HC A04/MF A01 CSCL 04A

The archived tape products from the spectral scan mode measurements of solar irradiance (SUNC tapes) and Earth radiance (EARTH tapes) by the Solar Backscatter UV (SBUV) instrument aboard Nimbus 7 are described. Incoming radiation from 160 to 400 nm is measured at intervals of 0.2 nm. The scan-to-scan repeatability of the solar irradiance measurements ranges from approximately 0.5 to 1 percent longward of 280 nm, to 2 percent around 210 nm and 4 percent near 175 nm. The repeatability of the Earth radiance values ranges from 2 to 3 percent at longer wavelengths and low zenith angles to 10 percent at shorter wavelengths and high zenith angles. The tape formats are described in detail, including file structure and contents of each type of record. Catalogs of the tapes and the time period covered are provided, along with lists of the days lacking solar irradiance measurements and the days dedicated to Earth radiance measurements. The method for production of the tapes is outlined and quality control measures are described. How radiances and irradiances are derived from the raw counts, the corrections for changes in instrument sensitivity, and related uncertainties are discussed. Author

**N89-22152\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

#### **NIMBUS-7 DATA PRODUCT SUMMARY**

ARNOLD G. OAKES, DAESOO HAN, H. LEE KYLE, GENE CARL FELDMAN, ALBERT J. FLEIG, EDWARD J. HURLEY, and BARBARA A. KAUFMAN (General Sciences Corp., Laurel, MD.) Feb. 1989 103 p (NAS5-29386)

(NASA-RP-1215; REPT-89B00074; NAS 1.61:1215) Avail: NTIS HC A06/MF A01 CSCL 04A

Data sets resulting from the first nine years of operations of the Nimbus-7 Satellite are briefly described. After a brief description of the Nimbus-7 Mission, each of the eight experiments on-board the satellite (Coastal Zone Color Scanner (CZCS), Earth Radiation Budget (ERB), Limb Infrared Monitor of the Stratosphere (MIMS), Stratospheric Aerosol Measurement II (SAM II), Stratospheric and Mesospheric Sounder (SAMS), Solar Backscatter Ultraviolet/Total Ozone Mapping Spectrometer (SBUV/TOMS), Scanning Multichannel Microwave Radiometer (SMMR) and the Temperature Humidity Infrared Radiometer (THIR) are introduced and their respective data products are described in terms of media, general format, and suggested applications. Extensive references are provided. Instructions for obtaining further information, and for ordering data products are given. Author

**N89-26274\*#** National Aeronautics and Space Administration, Washington, DC.

#### **PLANETARY GEOSCIENCES, 1988**

MARIA T. ZUBER, ed., JEFF L. PLESCIA, ed., ODETTE B. JAMES, ed., and GLENN MACPHERSON, ed. (Smithsonian Institution, Washington, DC.) Aug. 1989 113 p Original contains color illustrations

(NASA-SP-498; NAS 1.21:498; LC-88-600456) Avail: NTIS HC A06/MF A01 CSCL 08G

Research topics within the NASA Planetary Geosciences Program are presented. Activity in the fields of planetary geology, geophysics, materials, and geochemistry is covered. The investigator's current research efforts, the importance of that work

in understanding a particular planetary geoscience problem, the context of that research, and the broader planetary geoscience effort is described. As an example, theoretical modelling of the stability of water ice within the Martian regolith, the applicability of that work to understanding Martian volatiles in general, and the geologic history of Mars is discussed. Author

**N89-26275\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

#### **POLAR MICROWAVE BRIGHTNESS TEMPERATURES FROM NIMBUS-7 SMMR: TIME SERIES OF DAILY AND MONTHLY MAPS FROM 1978 TO 1987**

JOSEFINO C. COMISO and H. JAY ZWALLY Jul. 1989 89 p (NAS5-29386)

(NASA-RP-1223; REPT-89B00167; NAS 1.61:1223) Avail: NTIS HC A05/MF A01 CSCL 04A

A time series of daily brightness temperature gridded maps (October 25, 1978 through August 15, 1987) were generated from all ten channels of the Nimbus-7 Scanning Multichannel Microwave Radiometer orbital data. This unique data set can be utilized in a wide range of applications including heat flux, ocean circulation, ice edge productivity, and climate studies. Two sets of data in polar stereographic format are created for the Arctic region: one with a grid size of about 30 km on a 293 by 293 array similar to that previously utilized for the Nimbus-5 Electrically Scanning Microwave Radiometer, while the other has a grid size of about 25 km on a 448 by 304 array identical to what is now being used for the DMSP Scanning Multichannel Microwave Imager. Data generated for the Antarctic region are mapped using the 293 by 293 grid only. The general technique for mapping, and a quality assessment of the data set are presented. Monthly and yearly averages are also generated from the daily data and sample geophysical ice images and products derived from the data are given. Contour plots of monthly ice concentrations derived from the data for October 1978 through August 1987 are presented to demonstrate spatial and temporal detail which this data set can offer, and to show potential research applications. Author

**N90-22824\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

#### **SEARISE: A MULTIDISCIPLINARY RESEARCH INITIATIVE TO PREDICT RAPID CHANGES IN GLOBAL SEA LEVEL CAUSED BY COLLAPSE OF MARINE ICE SHEETS**

ROBERT A. BINDSCHADLER, ed. 1990 55 p Workshop held in College Park, MD, 23-25 Jan. 1990; sponsored by NASA and NSF

(NASA-CP-3075; REPT-90-077; NAS 1.55:3075) Avail: NTIS HC A04/MF A01 CSCL 08C

ANTARCTIC REGIONS, ATMOSPHERIC TEMPERATURE, CLIMATE CHANGE, ICE ENVIRONMENTS, POLAR REGIONS, PROJECT PLANNING, SEA ICE, SEA LEVEL

## 43

### EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

**N87-22281\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

#### **SURFACE BIDIRECTIONAL REFLECTANCE PROPERTIES OF TWO SOUTHWESTERN ARIZONA DESERTS FOR WAVELENGTHS BETWEEN 0.4 AND 2.2 MICROMETERS**

CHARLES H. WHITLOCK, G. CARLTON PURGOLD, and STUART R. LECROY (PRC Kentron, Inc., Hampton, Va.) May 1987 48 p

(NASA-TP-2643; L-16159; NAS 1.60:2643) Avail: NTIS HC A03/MF A01 CSCL 20F

### 43 EARTH RESOURCES AND REMOTE SENSING

ALBEDO, BIDIRECTIONAL REFLECTANCE, DESERTS, DIRECTIVITY, SOLAR POSITION, ZENITH

**N87-27315\*** National Aeronautics and Space Administration, Washington, DC.

**EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES (ISSUE 54)**

Aug. 1987 164 p  
(NASA-SP-7041(54); NAS 1.21:7041(54)) Avail: NTIS HC A08 CSCL 05B

This bibliography lists 562 reports, articles, and other documents introduced into the NASA scientific and technical information system between April 1 and June 30, 1987. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis.

Author

**N87-28162\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**EFFECTS OF AEROSOLS AND SURFACE SHADOWING ON BIDIRECTIONAL REFLECTANCE MEASUREMENTS OF DESERTS**

DAVID E. BOWKER and RICHARD E. DAVIS Sep. 1987 26 p  
(NASA-TP-2756; L-16327; NAS 1.60:2756) Avail: NTIS HC A03/MF A01 CSCL 04A

AEROSOLS, BIDIRECTIONAL REFLECTANCE, DESERTS, DUST, REMOTE SENSING, SHADOWS, SURFACE PROPERTIES

**N87-28955\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**ATLAS OF ABSORPTION LINES FROM 0 TO 17900 CM (SUP)-1**

J. H. PARK, L. S. ROTHMAN, C. P. RINSLAND, H. M. PICKETT, D. J. RICHARDSON, and J. S. NAMKUNG (ST Systems Corp., Hampton, Va.) Sep. 1987 197 p  
(NASA-RP-1188; L-16330; NAS 1.61:1188) Avail: NTIS HC A09/MF A02 CSCL 04A

Plots of logarithm (base 10) of absorption line strength versus wavenumber from 0 to 17900/cm(sup)-1 are shown for the 28 atmospheric gases (H<sub>2</sub>O, CO<sub>2</sub>, O<sub>3</sub>, N<sub>2</sub>O, CO, CH<sub>4</sub>, O<sub>2</sub>, NO, SO<sub>2</sub>, NO<sub>2</sub>, NH<sub>3</sub>, HNO<sub>3</sub>, OH, HF, HCl, HBr, HI, ClO, OCS, H<sub>2</sub>CO, HOCl, N<sub>2</sub>, HCN, CH<sub>3</sub>Cl, H<sub>2</sub>O<sub>2</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, PH<sub>3</sub>), which appear in the 1986 Air Force Geophysics Laboratory high-resolution transmission molecular absorption data base (HITRAN) compilation, and for O(P-3), O-18 isotopic ozone, and HO<sub>2</sub> from the 1984 JPL compilation in the 0- to 200/cm(sup)-1 region, and infrared solar CO lines at 4500 K. Also shown are plots of logarithm (base 10) of approximate infrared absorption cross sections of 11 heavy molecules versus wavenumber. The cross-section data cover 700 to 1800/cm(sup)-1 and are included as a separate data file in the 1986 HITRAN database.

Author

**N88-20714\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

**THE 1987 AIRBORNE ANTARCTIC OZONE EXPERIMENT: THE NIMBUS-7 TOMS DATA ATLAS**

ARLIN J. KRUEGER, PHILIP E. ARDANUY, FRANK S. SECHRIST, LANNING M. PENN, DAVID E. LARKO, SCOTT D. DOIRON, and REGINALD N. GALIMORE (Science Applications Research, Lanham, Md.) Mar. 1988 246 p  
(NASA-RP-1201; REPT-88B0107; NAS 1.61:1201) Avail: NTIS HC A11/MF A02 CSCL 04B

Total ozone data taken by the Nimbus-7 Total Ozone Mapping Spectrometer (TOMS) played a central role in the successful outcome of the 1987 Airborne Antarctic Ozone Experiment. The near-real-time TOMS total ozone observations were supplied within hours of real time to the operations center in Punta Arenas, Chile, over a telecommunications network designed specifically for this

purpose. The TOMS data preparation and method of transfer over the telecommunications links are reviewed. This atlas includes a complete set of the near-real-time TOMS orbital overpass data over regions around the Palmer Peninsula of Antarctica for the period of August 8 through September 29, 1987. Also provided are daily polar orthographic projections of TOMS total ozone measurements over the Southern Hemisphere from August through November 1987. In addition, a chronology of the salient points of the experiment, along with some latitudinal cross sections and time series at locations of interest of the TOMS total ozone observations are presented. The TOMS total ozone measurements are evaluated along the flight tracks of each of the ER-2 and DC-8 missions during the experiment. The ozone hole is shown here to develop in a monotonic progression throughout late August and September. The minimum total ozone amount was found on 5 October, when its all-time lowest value of 109 DU is recorded. The hole remains well defined, but fills gradually from mid-October through mid-November. The hole's dissolution is observed here to begin in mid-November, when it elongates and begins to rotate. By the end of November, the south pole is no longer located within the ozone hole.

Author

**N88-23314\*** National Aeronautics and Space Administration, Washington, DC.

**EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES (ISSUE 57)**

May 1988 129 p  
(NASA-SP-7041(57); NAS 1.21:7041(57)) Avail: NTIS HC A07 CSCL 08B

This bibliography lists 451 reports, articles and other documents introduced into the NASA scientific and technical information system between January 1 and March 31, 1988. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis.

Author

**N89-10401\*#** National Aeronautics and Space Administration, Washington, DC.

**SAPPING FEATURES OF THE COLORADO PLATEAU: A COMPARATIVE PLANETARY GEOLOGY FIELD GUIDE**

ALAN D. HOWARD, ed., R. CRAIG KOCHER, ed., and HENRY E. HOLT, ed. (Geological Survey, Flagstaff, Ariz.) 1987 115 p  
Original contains color illustrations  
(NSG-7572)

(NASA-SP-491; NAS 1.21:491; LC-87-15305) Avail: NTIS HC A06/MF A01; also available SOD HC \$6.00 as 003-000-01027-3 CSCL 08H

This book is an attempt to determine geomorphic criteria to be used to distinguish between channels formed predominantly by sapping and seepage erosion and those formed principally by surface runoff processes. The geologic nature of the Colorado Plateau has resulted in geomorphic features that show similarities to some areas on Mars, especially certain valley networks within thick sandstone formations. Where spring sapping is an effective process, the valleys that develop are unique in terms of their morphology and network pattern.

Author

**N89-12114\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

**LANDSAT-4 AND LANDSAT-5 MULTISPECTRAL SCANNER COHERENT NOISE CHARACTERIZATION AND REMOVAL**

JAMES C. TILTON and WILLIAM L. ALFORD (Defense Mapping Agency, Washington, D.C.) Feb. 1988 46 p  
(NASA-TP-2595-REV; NAS 1.60:2595-REV; REPT-86B0040) Avail: NTIS HC A03/MF A01 CSCL 08B

COHERENT ELECTROMAGNETIC RADIATION, ELECTROMAGNETIC NOISE, LANDSAT 4, LANDSAT 5, MULTISPECTRAL BAND SCANNERS, NOISE REDUCTION

### 43 EARTH RESOURCES AND REMOTE SENSING

**N89-29825\*** National Aeronautics and Space Administration, Washington, DC.

#### **EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES (ISSUE 62)**

Nov. 1988 146 p

(NASA-SP-7041(62); NAS 1.21:7041(62)) Avail: NTIS HC A07; NTIS standing order as PB89-903800, \$15.50 domestic, \$31.00 foreign CSCL 08B

This bibliography lists 544 reports, articles, and other documents introduced into the NASA scientific and technical information system between April 1 and June 30, 1989. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis.

Author

**N90-12091\*** National Aeronautics and Space Administration, Washington, DC.

#### **EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES (ISSUE 63)**

Oct. 1989 128 p

(NASA-SP-7041(63); NAS 1.21:7041(63)) Avail: NTIS HC A07; NTIS standing order as PB89-903800, \$15.50 domestic, \$31.00 foreign CSCL 08B

This bibliography lists 449 reports, articles, and other documents introduced into the NASA scientific and technical information system between July 1 and September 31, 1989. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, oceanography and marine resources, hydrology and water management, data processing and distribution systems, and instrumentation and sensors.

Author

**N90-23780\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

#### **SENSOR PERFORMANCE ANALYSIS**

H. E. MONTGOMERY, H. OSTROW, and G. M. RESSLER (Ressler Associates, Inc., Laurel, MD.) Washington Jul. 1990 90 p (NASA-RP-1241; REPT-89B00057; NAS 1.61:1241) Avail: NTIS HC A05/MF A01 CSCL 14B

The theory is described and the equations required to design are developed and the performance of electro-optical sensor systems that operate from the visible through the thermal infrared spectral regions are analyzed. Methods to compute essential optical and detector parameters, signal-to-noise ratio, MTF, and figures of merit such as NE delta rho and NE delta T are developed. A set of atmospheric tables are provided to determine scene radiance in the visible spectral region. The Planck function is used to determine radiance in the infrared. The equations developed were incorporated in a spreadsheet so that a wide variety of sensor studies can be rapidly and efficiently conducted.

Author

**N90-27140\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

#### **EARTH SCIENCES REQUIREMENTS FOR THE INFORMATION SCIENCES EXPERIMENT SYSTEM**

DAVID E. BOWKER, ed., STEVE J. KATZBERG, ed., and R. GALE WILSON, ed. Washington Jul. 1990 220 p Workshop held in Williamsburg, VA, 1-4 May 1989 (NASA-CP-3072; L-16773; NAS 1.55:3072) Avail: NTIS HC A10/MF A02 CSCL 05B

CONFERENCES, DATA PROCESSING EQUIPMENT, EARTH OBSERVING SYSTEM (EOS), EQUIPMENT SPECIFICATIONS, REAL TIME OPERATION, SUPPORT SYSTEMS

### 44

### ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

**N87-26413\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

#### **SPACE PHOTOVOLTAIC RESEARCH AND TECHNOLOGY 1988. HIGH EFFICIENCY, SPACE ENVIRONMENT, AND ARRAY TECHNOLOGY**

Jun. 1987 375 p Conference held in Cleveland, Ohio, 7-9 Oct. 1986

(NASA-CP-2475; E-3450; NAS 1.55:2475) Avail: NTIS HC A16/MF A03 CSCL 10B

CONFERENCES, ENERGY CONVERSION EFFICIENCY, PHOTOVOLTAIC CONVERSION, SOLAR CELLS, SPACECRAFT POWER SUPPLIES

**N87-29914\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

#### **SPACE ELECTROCHEMICAL RESEARCH AND TECHNOLOGY (SERT)**

Sep. 1987 364 p Conference held in Cleveland, Ohio, 14-16 Apr. 1987

(NASA-CP-2484; E-3506; NAS 1.55:2484) Avail: NTIS HC A16/MF A03 CSCL 10C

ELECTRIC BATTERIES, ELECTROCATALYSTS, ELECTRO-CHEMISTRY, MATHEMATICAL MODELS, REGENERATIVE FUEL CELLS

**N89-22982\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

#### **SPACE ELECTROCHEMICAL RESEARCH AND TECHNOLOGY CONFERENCE: ABSTRACTS Abstracts Only**

Washington 1989 49 p Conference held in Cleveland, OH, 11-13 Apr. 1989

(NASA-CP-10029; E-4708; NAS 1.55:10029) Avail: NTIS HC A03/MF A01 CSCL 10A

AEROSPACE SYSTEMS, CONFERENCES, ELECTROCATALYSTS, ELECTROCHEMISTRY, ELECTRODES, ENERGY STORAGE, HYDROGEN OXYGEN FUEL CELLS, STORAGE BATTERIES

**N89-24704\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

#### **SPACE PHOTOVOLTAIC RESEARCH AND TECHNOLOGY, 1988. HIGH EFFICIENCY, SPACE ENVIRONMENT, AND ARRAY TECHNOLOGY**

Washington Apr. 1989 362 p Conference held in Cleveland, OH, 19-21 Apr. 1988

(NASA-CP-3030; E-4587; NAS 1.55:3030) Avail: NTIS HC A16/MF A03 CSCL 10A

CONFERENCES, PHOTOVOLTAIC EFFECT, SOLAR ARRAYS, SOLAR CELLS, SPACECRAFT POWER SUPPLIES

**N90-20454\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

#### **SPACE ELECTROCHEMICAL RESEARCH AND TECHNOLOGY (SERT), 1989**

RICHARD S. BALDWIN, ed. Washington Dec. 1989 351 p Conference held in Cleveland, OH, 11-13 Apr. 1989

(NASA-CP-3056; E-4708; NAS 1.55:3056) Avail: NTIS HC A16/MF A02 CSCL 10A

CONFERENCES, ELECTRIC BATTERIES, ELECTRIC ENERGY STORAGE, ELECTROCATALYSTS, ELECTROCHEMISTRY, ELECTRODE MATERIALS, HYDROGEN OXYGEN FUEL CELLS, NICKEL HYDROGEN BATTERIES, SPACECRAFT POWER SUPPLIES



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## ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

**N89-14503\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**POLAR OZONE WORKSHOP. ABSTRACTS**

ARTHUR C. AIKIN May 1988 306 p Workshop held in Snowmass, CO, 9-13 May 1988; sponsored by NASA, NOAA, NSF, Chemical Mfgs. Association, WMO, and the United Nations Environment Program Sponsored by NASA, Washington, DC (NASA-CP-10014; REPT-88B0234; NAS 1.55:10014) Avail: NTIS HC A14/MF A03 CSCL 13B

ANTARCTIC REGIONS, ATMOSPHERIC CHEMISTRY, ATMOSPHERIC COMPOSITION, CONFERENCES, EARTH OBSERVATIONS (FROM SPACE), OZONE, OZONE DEPLETION, OZONOMETRY, POLAR METEOROLOGY, STRATOSPHERE

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## GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

**N87-11358\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**AIRBORNE LIDAR MEASUREMENTS OF EL CHICHON STRATOSPHERIC AEROSOLS, MAY 1983**

M. P. MCCORMICK and M. T. OSBORN (SASC Technologies, Inc., Hampton, Va.) Oct. 1986 91 p (NASA-RP-1172; L-16176; NAS 1.61:1172) Avail: NTIS HC A05/MF A01

An experimental survey flight to determine the spatial distribution and aerosol characteristics of the El Chichon-produced stratospheric aerosol was conducted in May 1983. The mission included several different sensors flown aboard the NASA Convair 990 at latitudes between 72 deg. and 56 deg. S. This report presents the lidar data from that flight mission. Representative profiles of lidar backscatter ratio, plots of integrated backscattering function versus latitude, and contours of backscatter mixing ratio versus altitude and latitude are given. In addition, tables containing numerical values of the backscatter ratio and backscattering function versus altitude are supplied for each profile. By May 1983, material produced by the El Chichon eruptions of late March-early April 1982 had spread throughout the latitudes covered by this mission. However, the most massive portion of the material resided north of 33 deg. N and was concentrated below 21 km. In this latitude region (33 deg. N to 72 deg. N), peak backscatter ratios at a wavelength of 0.6943 microns varied between 3.5 and 4.5, and the peak integrated backscattering function was about  $18 \times 10$  to the  $-4$  power/sr, corresponding to a peak optical depth calculated to be approximately 0.08. This report presents the results of this mission in a ready-to-use format for atmospheric and climatic studies. Author

**N87-13022\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**DESCRIPTION OF DATA ON THE NIMBUS 7 LIMS MAP ARCHIVE TAPE: OZONE AND NITRIC ACID**

E. E. REMSBERG, R. J. KURZEJA, K. V. HAGGARD, J. M. RUSSELL, III, and L. L. GORDLEY Dec. 1986 73 p (NASA-TP-2625; L-16136; NAS 1.60:2625) Avail: NTIS HC A04/MF A01 CSCL 04A

INFRARED DETECTORS, KALMAN FILTERS, NIMBUS 7 SATELLITE, NITRIC ACID, OZONE, STRATOSPHERE

**N87-15528\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**FUTURE DIRECTIONS FOR H SUB X O SUB Y DETECTION**

DAVID R. CROSLLEY, ed. (SRI International Corp., Menlo Park, Calif.) and JAMES M. HOELL, ed. Dec. 1986 67 p Workshop held in Menlo Park, Calif., 12-15 Aug. 1985 (NASA-CP-2448; L-16216; NAS 1.55:2448) Avail: NTIS HC A04/MF A01 CSCL 04A

ATMOSPHERIC COMPOSITION, HYDROGEN PEROXIDE, HYDROXYL RADICALS, TROPOSPHERE, WATER

**N87-17417\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**SAGE AEROSOL MEASUREMENTS. VOLUME 3: JANUARY 1, 1981 TO NOVEMBER 18, 1981**

M. PATRICK MCCORMICK Feb. 1987 274 p (NASA-RP-1173; L-16177; NAS 1.61:1173) Avail: NTIS HC A12/MF A02 CSCL 04A

The Stratospheric Aerosol and Gas Experiment (SAGE) satellite system, launched February 18, 1979, obtained profiles of aerosol extinction at 1.00 micron and 0.45 micron ozone concentration, and nitrogen dioxide concentration. Data taken during sunset events are presented in the form of zonal and seasonal averages of aerosol extinction of 1.00 micron and 0.45 micron, ratios of aerosol extinction to molecular extinction at 1.00 micron and ratios of aerosol extinction at 0.45 micron to aerosol extinction at 1.00 micron. Averages for 1981 are shown in tables, and in profile and contour plots (as a function of altitude and latitude). In addition, temperature data provided by NOAA for the time and location of each SAGE measurement are averaged and shown in a similar format. The stratospheric aerosol distribution for 1981 shows effects of volcanically injected material from eruptions of Ulawun, Alaid, and Pagan. Peak values of aerosol extinction at 0.45 micron and 1.00 micron were 2 to 4 times higher than typical peak values observed during near background conditions. Stratospheric aerosol optical depth values at 1.00 microns increased by a factor of about 2 from near background levels in regions of volcanic activity. During the year, these values ranged from between 0.001 and 0.006. The largest were near the location of a recent eruption. The distribution of the ratio of aerosol to molecular extinction at 1.00 microns also showed that maximum values are found in the vicinity of an eruption. These maximums varied in altitude, but remained below a height of about 25 km. No attempt has been made to give detailed explanations or interpretations of these data. The intent is to provide, in a ready-to-use visual format, representative zonal and seasonal averages of aerosol extinction data for the third calendar year of the SAGE data set to facilitate atmospheric and climatic studies. Author

**N87-18248\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**SPACE OPPORTUNITIES FOR TROPOSPHERIC CHEMISTRY RESEARCH**

JOEL S. LEVINE, ed. Feb. 1987 92 p Workshop held in New York, N.Y., 9-13 Sep. 1985 (NASA-CP-2450; L-16250; NAS 1.55:2450) Avail: NTIS HC A05/MF A01 CSCL 04A

AEROSOLS, AIR POLLUTION, ATMOSPHERIC CHEMISTRY, ATMOSPHERIC COMPOSITION, CONFERENCES, GASES, REMOTE SENSING, TROPOSPHERE

**N87-20663\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**AIRBORNE LIDAR MEASUREMENTS OF EL CHICHON STRATOSPHERIC AEROSOLS, JANUARY 1984**

M. PATRICK MCCORMICK and M. T. OSBORN (ST Systems Corp., Hampton, Va.) Apr. 1987 49 p (NASA-RP-1175; L-16234; NAS 1.61:1175) Avail: NTIS HC A03/MF A01 CSCL 04A

A lidar-equipped NASA Electra aircraft was flown in January 1984 between the latitude of 38 and 90 deg N. One of the primary purposes of this mission was to determine the spatial distribution and aerosol characteristics of El Chichon produced stratospheric

## 46 GEOPHYSICS

material. Lidar data from that portion of the flight mission between 38 deg N and 77 deg N is presented. Representative profiles of lidar backscatter ratio, a plot of the integral backscattering function versus latitude, and contours of backscatter mixing ratio versus altitude and latitude are given. In addition, tables containing numerical values of the backscatter ratio and backscattering function versus altitude are applied for each profile. These data clearly show that material produced by the El Chichon eruptions of late March-early April 1982 had spread throughout the latitudes covered by this mission, and that the most massive portion of the material resided north of 55 deg N and was concentrated below 17 km in a layer that peaked at 13 to 15 km. In this latitude region, peak backscatter ratios at a wavelength of 0.6943 microns were approximately 3 and the peak integrated backscattering function was about  $15 \times 10$  to the -4/sr corresponding to a peak optical depth of approximately 0.07. This report presents the results of this mission in a ready-to-use format for atmospheric and climatic studies. Author

**N87-20665\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **UPPER AND MIDDLE ATMOSPHERIC DENSITY MODELING REQUIREMENTS FOR SPACECRAFT DESIGN AND OPERATIONS**

M. H. DAVIS, ed. (Universities Space Research Association, Boulder, Colo.), R. E. SMITH, ed., and D. L. JOHNSON, ed. Feb. 1987 290 p Workshop held in Huntsville, Ala., 19-21 1985 (NAS8-36400)

(NASA-CP-2460; M-548; NAS 1.55:2460) Avail: NTIS HC A13/MF A02 CSCL 04A

**AEROSPACE ENVIRONMENTS, ATMOSPHERIC DENSITY, ATMOSPHERIC MODELS, SPACECRAFT DESIGN, THERMOSPHERE**

**N88-18084\*#** National Aeronautics and Space Administration, Washington, DC.

### **INTO THE THERMOSPHERE: THE ATMOSPHERE EXPLORERS**

ERIC BURGESS and DOUGLASS TORR 1987 172 p Original document contains color illustrations

(NASA-SP-490; NAS 1.21:490; LC-87-14156) Avail: SOD HC \$14.00 as 033-000-01013-3; NTIS MF A01 CSCL 04A

The need to study the lower thermosphere with the new instrument, data handling, and spacecraft technology available in the 1960s led to the formulation and establishment of the Atmospheric Explorer program. This book provides an overview of this program with particular emphasis on the AE3, AE4, and AE5 satellites, which represent early examples of problem-dedicated missions. Both the satellites and their instrumentation on the one hand and the experimental and scientific considerations in studying the thermosphere on the other are discussed. J.P.B.

**N88-19037\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

### **CRUSTAL DYNAMICS PROJECT: CATALOGUE OF SITE INFORMATION**

CAREY E. NOLL, ed. Mar. 1988 539 p (NASA-RP-1198; REPT-88B9999; NAS 1.61:1198) Avail: NTIS HC A23/MF A03 CSCL 08G

This document represents a catalog of site information for the Crustal Dynamics Project. It contains information on and descriptions of those sites used by the Project as observing stations for making the precise geodetic measurements necessary for studies of the Earth's crustal movements and deformation. Author

**N88-25094\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **SAM 2 DATA USER'S GUIDE**

W. P. CHU, M. T. OSBORN (ST Systems Corp., Hampton, Va.), and L. R. MCMASTER Jul. 1988 29 p

(NASA-RP-1200; L-16377; NAS 1.61:1200) Avail: NTIS HC A03/MF A01 CSCL 04A

This document is intended to serve as a guide to the use of

the data products from the Stratospheric Aerosol Measurement (SAM) 2 experiment for scientific investigations of polar stratospheric aerosols. Included is a detailed description of the Beta and Aerosol Number Density Archive Tape (BANAT), which is the SAM 2 data product containing the aerosol extinction data available for these investigations. Also included are brief descriptions of the instrument operation, data collection, processing and validation, and some of the scientific analyses conducted to date. Author

**N88-29233\*#** National Aeronautics and Space Administration, Washington, DC.

### **PRESENT STATE OF KNOWLEDGE OF THE UPPER ATMOSPHERE 1988: AN ASSESSMENT REPORT**

R. T. WATSON, M. J. PRATHER, and M. J. KURYLO Jun. 1988 203 p

(NASA-RP-1208; NAS 1.61:1208) Avail: NTIS HC A10/MF A02 CSCL 04A

This document was issued in response to the Clean Air Act Amendments of 1977, Public Law 95-95, mandating that NASA and other key agencies submit biennial reports to Congress and EPA. NASA is to report on the state of our knowledge of the upper atmosphere, particularly the stratosphere. This is the sixth ozone assessment report submitted to Congress and the concerned regulatory agencies. Part 1 contains an outline of the NASA Upper Atmosphere Research Program and summaries of the research efforts supported during the last two years. An assessment is presented of the state of knowledge as of March 15, 1988 when the Ozone Trends Panel, organized by NASA and co-sponsored by the World Meteorological Organization, NOAA, FAA and the United Nations Environment Program released an executive summary of its findings from a critical in-depth study involving over 100 scientists from 12 countries. Chapter summaries of the International Ozone Trends Panel Report form the major part of this report. Two other sections are Model Predictions of Future Ozone Change and Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling. Each of these sections and the report in its entirety were peer reviewed. Author

**N88-29234\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **FORTY-EIGHT-INCH LIDAR AEROSOL MEASUREMENTS TAKEN AT THE LANGLEY RESEARCH CENTER, MAY 1974 TO DECEMBER 1987**

W. H. FULLER, JR., M. T. OSBORN, and W. H. HUNT (Wyle Labs., Inc., Hampton, Va.) Oct. 1988 102 p

(NASA-RP-1209; L-16473; NAS 1.61:1209) Avail: NTIS HC A06/MF A01 CSCL 04A

A ground based lidar system located at NASA Langley Research Center in Hampton, Va., was used to obtain high resolution vertical profiles of the stratospheric and upper tropospheric aerosol since 1974. More than 200 measurements obtained at a wavelength of 0.6943 microns during 1974 to 1987 are summarized. Plots of peak backscatter mixing ratio and integrated backscatter vs time are presented for the entire measurement sequence. The plots highlight the influence of several major volcanic eruptions on the long term stratospheric aerosol layer. In particular, the eruptions of El Chichon in late Mar. to early Apr. 1982, produced a massive aerosol layer. Aerosol enhancement from El Chichon reached Hampton, Va. by May 1982, with a scattering ratio of approx. 50 detected on Jul. 1, 1982. In addition, scattering ratio profiles for June 1982 to December 1987, along with tables containing numerical values of the backscatter ratio and backscattering function versus altitude, are included to further describe the upper tropospheric and stratospheric aerosol layer. A 14 year summary is presented, in a ready to use format, of lidar observations at a fixed midlatitude location to be used for further study. Author

**N89-10420\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **COMPILATION OF METHODS IN ORBITAL MECHANICS AND SOLAR GEOMETRY**

JAMES J. BUGLIA Washington Oct. 1988 81 p  
(NASA-RP-1204; L-16451; NAS 1.61:1204) Avail: NTIS HC  
A05/MF A01 CSCL 04A

This paper contains a collection of computational algorithms for determining geocentric ephemerides of Earth satellites, useful for both mission planning and data reduction applications. Special emphasis is placed on the computation of sidereal time, and on the determination of the geocentric coordinate of the center of the Sun, all to the accuracy found in the Astronomical Almanac. The report is completely self-contained in that no requirement is placed on any external source of information, and hence, these methods are ideal for computer application. Author

**N89-25540\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**COMPARISON OF SATELLITE-DERIVED DYNAMICAL QUANTITIES FOR THE STRATOSPHERE OF THE SOUTHERN HEMISPHERE**

THOMAS MILES, ed. and ALAN ONEILL, ed. Washington Jul. 1989 39 p Presented at the Workshop on the Middle Atmosphere in the Southern Hemisphere, Williamsburg, VA, 14-17 Apr. 1986; sponsored by NASA, Washington, DC  
(NASA-CP-3044; L-16593; NAS 1.55:3044) Avail: NTIS HC  
A03/MF A01 CSCL 04A

ATMOSPHERIC CIRCULATION, GEOPOTENTIAL HEIGHT, SATELLITE OBSERVATION, STRATOSPHERE, ZONAL FLOW (METEOROLOGY)

**N89-26304\*#** Oxford Univ. (England). Dept. of Atmospheric Physics.

**NIMBUS-7 STRATOSPHERIC AND MESOSPHERIC SOUNDER (SAMS) EXPERIMENT DATA USER'S GUIDE**

F. W. TAYLOR, C. D. RODGERS, S. T. NUTTER, and N. OSLIK (ST Systems Corp., Lanham, MD.) Washington May 1989 149 p  
(NAS5-28063)

(NASA-RP-1221; NAS 1.61:1221; REPT-89B00074) Avail: NTIS  
HC A07/MF A01 CSCL 08G

The Stratospheric and Mesospheric Sounder (SAMS) aboard Nimbus-7 observes infrared radiation from the atmospheric limb. Global upper atmosphere temperature profiles and vertical concentrations of H<sub>2</sub>O, NO, N<sub>2</sub>O, CH<sub>4</sub> and CO<sub>2</sub> are derived from these measurements. The status of all channels was carefully monitored. Temperature and composition were retrieved from the measurements by linearizing the direct equation about an a priori profile and using an optimum statistical estimator to find the most likely solution. The derived temperature and composition profiles are archived on two tape products whose file structure and record formats are described in detail. The gridded retrieved temperature tape (GRID-T) contains daily day and night average temperatures at 62 pressure levels in a 2.5 degree latitude by 10 degree longitude grid extending from 67.5 degrees N to 50 degrees S. The zonal mean methane and nitrous oxide composition tape (ZMT-G) contains zonal mean day and night average CH<sub>4</sub> and N<sub>2</sub>O mixing ratios at 31 pressure levels for 2.5 degrees latitude zones extending from 67.5 degrees N to 50 degrees S. Author

**N89-28969\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**A HIGH-RESOLUTION ATLAS OF THE INFRARED SPECTRUM OF THE SUN AND THE EARTH ATMOSPHERE FROM SPACE. A COMPILATION OF ATMOS SPECTRA OF THE REGION FROM 650 TO 4800 CM-1 (2.3 TO 16 MICRONS). VOLUME 2: STRATOSPHERE AND MESOSPHERE, 650 TO 3350 CM-1**

CROFTON B. FARMER and ROBERT H. NORTON Washington 1989 688 p  
(NAS7-918)

(NASA-RP-1224-VOL-2; JPL-400-370-VOL-2; NAS 1.61:1224-VOL-2; LC-89-600203) Avail: NTIS HC A99/MF A04 CSCL 04A

During the period April 29 to May 2, 1985, the Atmospheric Trace Molecule Spectroscopy (ATMOS) experiment was operated for the first time, as part of the Spacelab-3 payload of the shuttle

Challenger. The principal purpose of this experiment was to study the distributions of the atmosphere's minor and trace molecular constituents. The instrument, a modified Michelson interferometer covering the frequency range from 600 to 5000/cm-1 at a spectral resolution of 0.01/cm-1, recorded infrared absorption spectra of the sun and of the earth's atmosphere at times close to entry into and exit from occultation by the earth's limb. Spectra were obtained that are free from absorptions due to constituents of the atmosphere (i.e., they are pure solar spectra), as well as spectra of the atmosphere itself, covering line-of-sight tangent altitudes that span the range from the lower thermosphere to the bottom of the troposphere. This atlas presents a compilation of these spectra arranged in a hardcopy format suitable for quick-look reference purposes. Volume 2 covers the stratosphere and mesosphere (i.e., tangent altitudes from 20 to 80 km) for frequencies from 650 to 3350/cm-1. Author

**N90-11405\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

**TWO-DIMENSIONAL INTERCOMPARISON OF STRATOSPHERIC MODELS**

CHARLES H. JACKMAN, ed., ROBERT K. SEALS, JR., ed., and MICHAEL J. PRATHER, ed. (National Aeronautics and Space Administration, Goddard Inst. for Space Studies, New York, NY.) Aug. 1989 606 p Workshop held in Virginia Beach, VA, 11-16 Sep. 1988; sponsored by NASA, Washington  
(NASA-CP-3042; REPT-89B00192; NAS 1.55:3042) Avail: NTIS  
HC A99/MF A04 CSCL 04A

ATMOSPHERIC MODELS, CONFERENCES, DATA BASES, PHOTOCHEMICAL REACTIONS, RADIATIVE TRANSFER, STRATOSPHERE, TWO DIMENSIONAL MODELS

**N90-13893\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**A HIGH-RESOLUTION ATLAS OF THE INFRARED SPECTRUM OF THE SUN AND THE EARTH ATMOSPHERE FROM SPACE: A COMPILATION OF ATMOS SPECTRA OF THE REGION FROM 650 TO 4800 CM (2.3 TO 16 MICRON). VOLUME 1: THE SUN**

CROFTON B. FARMER and ROBERT H. NORTON 1989 535 p  
(NAS7-918)

(NASA-RP-1224-VOL-1; NAS 1.61:1224-VOL-1; JPL-400-370-VOL-1) Avail: NTIS HC A23/MF A03 CSCL 04A

During the period April 29 through May 2, 1985, the Atmospheric Trace Molecule Spectroscopy experiment was operated as part of the Spacelab-3 payload of the shuttle Challenger. The instrument, a modified Michelson Interferometer covering the frequency range from 600 to 5000/cm, at a spectral resolution of 0.01/cm, recorded infrared spectra of the Sun and of the Earth's atmosphere at times close to entry into and exit from occultation by the Earth's limb as seen from the shuttle orbit of 360 km. Spectra were obtained that are free from absorptions due to constituents of the atmosphere (i.e., solar pure spectra), as well as spectra of the atmosphere itself, covering line-of-sight tangent altitudes that span the range from the lower thermosphere to the bottom of the troposphere. This atlas, believed to be the first record of observations of the continuous high resolution infrared spectrum of the Sun and the Earth's atmosphere from space, provides a compilation of these spectra arranged in a hardcopy format suitable for quick-look reference purposes; the data are also available in digital form. Author

**N90-17227\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

**NIMBUS 7 SOLAR BACKSCATTER ULTRAVIOLET (SBUV) OZONE PRODUCTS USER'S GUIDE**

ALBERT J. FLEIG, R. D. MCPETERS, P. K. BHARTIA, BARRY M. SCHLESINGER, RICHARD P. CEBULA, K. F. KLENK, STEVEN L. TAYLOR (ST Systems Corp., Lanham, MD.), and DONALD F. HEATH Jan. 1990 117 p  
(NAS5-29386)

(NASA-RP-1234; REPT-636; NAS 1.61:1234) Avail: NTIS HC A06/MF A01 CSCL 04A

Three ozone tape products from the Solar Backscatter Ultraviolet (SBUV) experiment aboard Nimbus 7 were archived at the National Space Science Data Center. The experiment measures the fraction of incoming radiation backscattered by the Earth's atmosphere at 12 wavelengths. In-flight measurements were used to monitor changes in the instrument sensitivity. Total column ozone is derived by comparing the measurements with calculations of what would be measured for different total ozone amounts. The altitude distribution is retrieved using an optimum statistical technique for the inversion. The estimated initial error in the absolute scale for total ozone is 2 percent, with a 3 percent drift over 8 years. The profile error depends on latitude and height, smallest at 3 to 10 mbar; the drift increases with increasing altitude. Three tape products are described. The High Density SBUV (HDSBUV) tape contains the final derived products - the total ozone and the vertical ozone profile - as well as much detailed diagnostic information generated during the retrieval process. The Compressed Ozone (CPOZ) tape contains only that subset of HDSBUV information, including total ozone and ozone profiles, considered most useful for scientific studies. The Zonal Means Tape (ZMT) contains daily, weekly, monthly and quarterly averages of the derived quantities over 10 deg latitude zones. Author

**N90-20562\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**SATELLITE RADAR ALTIMETRY OVER ICE. VOLUME 1: PROCESSING AND CORRECTIONS OF SEASAT DATA OVER GREENLAND**

H. JAY ZWALLY, ANITA C. BRENNER, JUDITH A. MAJOR, THOMAS V. MARTIN (Van Martin Consulting, Inc., Rockville, MD.), and ROBERT A. BINDSCHADLER Jan. 1990 147 p

(NASA-RP-1233-VOL-1; REPT-89B00239; NAS 1.61:1233-VOL-1) Avail: NTIS HC A07/MF A01 CSCL 08C

The data-processing methods and ice data products derived from Seasat radar altimeter measurements over the Greenland ice sheet and surrounding sea ice are documented. The corrections derived and applied to the Seasat radar altimeter data over ice are described in detail, including the editing and retracking algorithm to correct for height errors caused by lags in the automatic range tracking circuit. The methods for radial adjustment of the orbits and estimation of the slope-induced errors are given. Author

**N90-20563\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**SATELLITE RADAR ALTIMETRY OVER ICE. VOLUME 2: USERS' GUIDE FOR GREENLAND ELEVATION DATA FROM SEASAT**

H. JAY ZWALLY, JUDITH A. MAJOR, ANITA C. BRENNER, ROBERT A. BINDSCHADLER, and THOMAS V. MARTIN (Van Martin Consulting, Inc., Rockville, MD.) Jan. 1990 84 p

(NASA-RP-1233-VOL-2; REPT-89B00240; NAS 1.61:1233-VOL-2) Avail: NTIS HC A05/MF A01 CSCL 08C

A gridded surface-elevation data set and a geo-referenced data base for the Seasat radar altimeter data over Antarctica are described. It is intended to be a user's guide to accompany the data provided to data centers and other users. The grid points are on a polar stereographic projection with a nominal spacing of 20 km. The gridded elevations are derived from the elevation data in the geo-referenced data base by a weighted fitting of a surface in the neighborhood of each grid point. The gridded elevations are useful for the creating smaller-scale contour maps, and examining individual elevation measurements in specific geographic areas. Tape formats are described, and a FORTRAN program for reading the data tape is listed and provided on the tape. Author

**N90-20564\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**SATELLITE RADAR ALTIMETRY OVER ICE. VOLUME 4: USERS' GUIDE FOR ANTARCTICA ELEVATION DATA FROM SEASAT**

H. JAY ZWALLY, JUDITH A. MAJOR, ANITA C. BRENNER, ROBERT A. BINDSCHADLER, and THOMAS V. MARTIN (Van Martin Consulting, Inc., Rockville, MD.) Jan. 1990 57 p (NASA-RP-1233-VOL-4; REPT-89B00241; NAS 1.61:1233-VOL-4) Avail: NTIS HC A04/MF A01 CSCL 08C

A gridded surface-elevation data set and a geo-referenced data base for the Seasat radar altimeter data over Greenland are described. This is a user guide to accompany the data provided to data centers and other users. The grid points are on a polar stereographic projection with a nominal spacing of 20 km. The gridded elevations are derived from the elevation data in the geo-referenced data base by a weighted fitting of a surface in the neighborhood of each grid point. The gridded elevations are useful for the creating of large-scale contour maps, and the geo-referenced data base is useful for regridding, creating smaller-scale contour maps, and examining individual elevation measurements in specific geographic areas. Tape formats are described, and a FORTRAN program for reading the data tape is listed and provided on the tape. Author

**N90-22850\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**SURFACE TOPOGRAPHY OF THE GREENLAND ICE SHEET FROM SATELLITE RADAR ALTIMETRY**

ROBERT A. BINDSCHADLER, H. JAY ZWALLY, JUDITH A. MAJOR, and ANITA C. BRENNER (ST Systems Corp., Greenbelt, MD.) 1989 127 p Original contains color illustrations

(NASA-SP-503; REPT-89B00170; NAS 1.21:503; LC-89-600282) Avail: NTIS HC A16/MF A02; 3 functional color pages CSCL 08E

Surface elevation maps of the southern half of the Greenland subcontinent are produced from radar altimeter data acquired by the Seasat satellite. A summary of the processing procedure and examples of return waveform data are given. The elevation data are used to generate a regular grid which is then computer contoured to provide an elevation contour map. Ancillary maps show the statistical quality of the elevation data and various characteristics of the surface. The elevation map is used to define ice flow directions and delineate the major drainage basins. Regular maps of the Jakobshavns Glacier drainage basin and the ice divide in the vicinity of Crete Station are presented. Altimeter derived elevations are compared with elevations measured both by satellite geocimeters and optical surveying. Author

**N90-28929\*#** National Aeronautics and Space Administration, Washington, DC.

**PRESENT STATE OF KNOWLEDGE OF THE UPPER ATMOSPHERE 1990: AN ASSESSMENT REPORT Report to the Congress**

R. T. WATSON, M. J. KURYLO, M. J. PRATHER, and F. M. ORMOND Sep. 1990 145 p

(NASA-RP-1242; NAS 1.61:1242) Avail: NTIS HC A07/MF A01 CSCL 04A

NASA is charged with the responsibility to report on the state of the knowledge of the Earth's upper atmosphere, particularly the stratosphere. Part 1 of this report, issued earlier this year, summarized the objectives, status, and accomplishments of the research tasks supported under NASA's Upper Atmosphere Research Program during the last two years. New findings since the last report to Congress was issued in 1988 are presented. Several scientific assessments of the current understanding of the chemical composition and physical structure of the stratosphere are included, in particular how the abundance and distribution of ozone is predicted to change in the future. These reviews include: a summary of the most recent international assessment of stratospheric ozone; a study of future chlorine and bromine loading of the atmosphere; a review of the photochemical and chemical kinetics data that are used as input parameters for the atmospheric models; a new assessment of the impact of Space Shuttle launches on the stratosphere; a summary of the environmental issues and needed research to evaluate the impact of the newly re-proposed fleet of stratospheric supersonic civil aircraft; and a list of the

contributors to this report and the science assessments which have formed our present state of knowledge of the upper atmosphere and ozone depletion. Author

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## METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

**N87-12086\*#** National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, VA.

**PRELIMINARY ESTIMATES OF RADIOSONDE THERMISTOR ERRORS**

F. J. SCHMIDLIN, J. K. LUERS (Dayton Univ., Ohio.), and P. D. HUFFMAN Washington, D.C. Sep. 1986 19 p (NASA-TP-2637; NAS 1.60:2637) Avail: NTIS HC A03/MF A01 CSCL 04B

ERROR ANALYSIS, RADIOSONDES, THERMISTORS

**N87-13043\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**NASA/MSFC FY-85 ATMOSPHERIC PROCESSES RESEARCH REVIEW**

W. W. VAUGHAN, comp. and F. PORTER, comp. Oct. 1985 143 p Review held in Huntsville, Ala. 7-9 May 1985 and in Columbia, Md., 8-12 Jul. 1985

(NASA-CP-2402; M-503; NAS 1.55:2402) Avail: NTIS HC A07/MF A02 CSCL 04B

ATMOSPHERIC ELECTRICITY, ATMOSPHERIC SOUNDING, DATA PROCESSING, DOPPLER RADAR, GEOPHYSICS, MESOSCALE PHENOMENA, OPTICAL RADAR, SATELLITE IMAGERY, THUNDERSTORMS, WIND (METEOROLOGY)

**N87-20701\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**ON REQUIREMENTS FOR A SATELLITE MISSION TO MEASURE TROPICAL RAINFALL**

OTTO W. THIELE, ed. Apr. 1987 67 p (NASA-RP-1183; NAS 1.61:1183) Avail: NTIS HC A04/MF A01 CSCL 04B

Tropical rainfall data are crucial in determining the role of tropical latent heating in driving the circulation of the global atmosphere. Also, the data are particularly important for testing the realism of climate models, and their ability to simulate and predict climate accurately on the seasonal time scale. Other scientific issues such as the effects of El Nino on climate could be addressed with a reliable, extended time series of tropical rainfall observations. A passive microwave sensor is planned to provide information on the integrated column precipitation content, its areal distribution, and its intensity. An active microwave sensor (radar) will define the layer depth of the precipitation and provide information about the intensity of rain reaching the surface, the key to determining the latent heat input to the atmosphere. A visible/infrared sensor will provide very high resolution information on cloud coverage, type, and top temperatures and also serve as the link between these data and the long and virtually continuous coverage by the geosynchronous meteorological satellites. The unique combination of sensor wavelengths, coverages, and resolving capabilities together with the low-altitude, non-Sun synchronous orbit provide a sampling capability that should yield monthly precipitation amounts to a reasonable accuracy over a 500- by 500-km grid. Author

**N87-22341\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ATMOSPHERIC TURBULENCE RELATIVE TO AVIATION, MISSILE, AND SPACE PROGRAMS**

DENNIS W. CAMP, ed. and WALTER FROST, ed. (FWG Associates, Inc., Tullahoma, Tenn.) Apr. 1987 257 p Workshop

held in Hampton, Va., 2-4 Apr. 1986 (NASA-CP-2468; L-16296; NAS 1.55:2468) Avail: NTIS HC A12/MF A02 CSCL 04B

AIRCRAFT SAFETY, ATMOSPHERIC MODELS, ATMOSPHERIC TURBULENCE, CONFERENCES, MISSILES, SPACE PROGRAMS, WEATHER FORECASTING

**N87-26489\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ATLAS OF WIDE-FIELD-OF-VIEW OUTGOING LONGWAVE RADIATION DERIVED FROM NIMBUS 6 EARTH RADIATION BUDGET DATA SET, JULY 1975 TO JUNE 1978**

T. DALE BESS and G. LOUIS SMITH Aug. 1987 80 p (NASA-RP-1185; L-16325; NAS 1.61:1185) Avail: NTIS HC A05/MF A01 CSCL 04B

An atlas of monthly mean outgoing longwave radiation global contour maps and associated spherical harmonic coefficients is presented. The atlas contains 36 months of continuous data from July 1975 to June 1978. The data were derived from the first Earth radiation budget experiment, which was flown on the Nimbus-6 Sun-synchronous satellite in 1975. Only the wide-field-of-view longwave measurements are cataloged in this atlas. The contour maps along with the associated sets of spherical harmonic coefficients form a valuable data set for studying different aspects of our changing climate over monthly, annual, and interannual scales in the time domain, and over regional, zonal, and global scales in the spatial domain. Author

**N87-26491\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**CALIBRATION OF THE SPIN-SCAN OZONE IMAGER ABOARD THE DYNAMICS EXPLORER 1 SATELLITE**

WALTER E. BRESSETTE, GERALD M. KEATING, and DAVID F. YOUNG (ST Systems Corp., Hampton, Va.) Aug. 1987 44 p (NASA-TP-2723; L-16150; NAS 1.60:2723) Avail: NTIS HC A03/MF A01 CSCL 04B

ALGORITHMS, CALIBRATING, DYNAMICS EXPLORER 1 SATELLITE, OZONE, REGRESSION ANALYSIS, ULTRAVIOLET SPECTROMETERS

**N87-29996\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**FIVE YEAR GLOBAL DATASET: NMC OPERATIONAL ANALYSES (1978 TO 1982)**

DAVID STRAUS and JOSEPH ARDIZZONE Sep. 1987 50 p Prepared in cooperation with Sigma Data Services Corp., Rockville, Md.

(NASA-RP-1194; REPT-87B0273; NAS 1.61:1194) Avail: NTIS HC A03/MF A01 CSCL 04B

This document describes procedures used in assembling a five year dataset (1978 to 1982) using NMC Operational Analysis data. These procedures entailed replacing missing and unacceptable data in order to arrive at a complete dataset that is continuous in time. In addition, a subjective assessment on the integrity of all data (both preliminary and final) is presented. Documentation on tapes comprising the Five Year Global Dataset is also included. Author

**N88-10451\*#** National Aeronautics and Space Administration. Washington, DC.

**ATLAS OF WIDE-FIELD-OF-VIEW OUTGOING LONGWAVE RADIATION DERIVED FROM NIMBUS 7 EARTH RADIATION BUDGET DATA SET - NOVEMBER 1978 TO OCTOBER 1985**

T. DALE BESS and G. LOUIS SMITH Aug. 1987 176 p (NASA-RP-1186; L-16326; NAS 1.61:1186) Avail: NTIS HC A09/MF A01 CSCL 04B

An atlas of monthly mean outgoing longwave radiation, global contour maps and associated spherical harmonic coefficients is presented. The atlas contains 84 months of continuous data from November 1978 to October 1985. The data were derived from the second Earth radiation budget experiment, which was flown on the Nimbus 7 Sun-synchronous satellite in 1978. This data set is a companion set and extension to a similar report of the Nimbus

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6 satellite. Together these two reports give a data set covering a 10 year time period and will be very valuable in studying different aspects of our changing climate over monthly, annual, and interannual scales in the time domain and over regional, zonal, and global scales in the spatial domain. Author

**N88-14572\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### DESCRIPTION OF DATA ON THE NIMBUS 7 LIMS MAP

#### ARCHIVE TAPE: WATER VAPOR AND NITROGEN DIOXIDE

KENNETH V. HAGGARD, B. T. MARSHALL (G and A Technical Software, Hampton, Va.), ROBERT J. KURZEJA (Du Pont de Nemours, E. I. and Co., Aiken, S.C.), ELLIS E. REMSBERG, and JAMES M. RUSSELL, III Feb. 1988 69 p

(NASA-TP-2761; L-16313; NAS 1.60:2761) Avail: NTIS HC A04/MF A01 CSCL 04B

ATMOSPHERIC COMPOSITION, EARTH LIMB, INFRARED DETECTORS, MAPPING, NIMBUS 7 SATELLITE, STRATOSPHERE

**N88-20772\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### SUMMARY OF ALONG-TRACK DATA FROM THE EARTH RADIATION BUDGET SATELLITE FOR SEVERAL MAJOR DESERT REGIONS

DAVID R. BROOKS and MARTA A. FENN May 1988 147 p (NASA-RP-1197; L-16401; NAS 1.61:1197) Avail: NTIS HC A07/MF A01 CSCL 04B

For several days in January and August 1985, the Earth Radiation Budget Satellite, a component of the Earth Radiation Budget Experiment (ERBE), was operated in an along-track scanning mode. A survey of radiance measurements is given for four desert areas in Africa, the Arabian Peninsula, Australia, and the Sahel region of Africa. Each overflight provides radiance information for four scene categories: clear, partly cloudy, mostly cloudy, and overcast. The data presented include the variation of radiance in each scene classification as a function of viewing zenith angle during each overflight of the five target areas. Several features of interest in the development of anisotropic models are evident, including day-night differences in longwave limb darkening and the azimuthal dependence of short wave radiance. There is some evidence that surface features may introduce thermal or visible shadowing that is not incorporated in the usual descriptions of the anisotropic behavior of radiance as viewed from space. The data also demonstrate that the ERBE scene classification algorithms give results that, at least for desert surfaces, are a function of viewing geometry. Author

### N88-25105\*# Tennessee Univ. Space Inst., Tullahoma. METEOROLOGICAL AND ENVIRONMENTAL INPUTS TO AVIATION SYSTEMS

DEVENIS W. CAMP, ed. and WALTER FROST, ed. Jun. 1988 226 p Workshop held in Tullahoma, Tenn., 12-14 Mar. 1985; sponsored by NASA, Washington, NOAA, FAA, DOD, and Office of the Federal Coordinator for Meteorology (NASA-CP-2498; L-16338; NAS 1.55:2498) Avail: NTIS HC A11/MF A02 CSCL 04B

AVIATION METEOROLOGY, FLIGHT SAFETY, WEATHER

**N88-27677\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### ANGULAR RADIATION MODELS FOR EARTH-ATMOSPHERE SYSTEM. VOLUME 1: SHORTWAVE RADIATION

J. T. SUTTLES, R. N. GREEN, P. MINNIS, G. L. SMITH, W. F. STAYLOR, B. A. WIELICKI, I. J. WALKER, D. F. YOUNG, V. R. TAYLOR, and L. L. STOWE (National Oceanic and Atmospheric Administration, Washington, D. C.) Jul. 1988 148 p (NASA-RP-1184; L-16414; NAS 1.61:1184) Avail: NTIS HC A07/MF A01 CSCL 04B

Presented are shortwave angular radiation models which are required for analysis of satellite measurements of Earth radiation, such as those from the Earth Radiation Budget Experiment (ERBE). The models consist of both bidirectional and directional parameters.

The bidirectional parameters are anisotropic function, standard deviation of mean radiance, and shortwave-longwave radiance correlation coefficient. The directional parameters are mean albedo as a function of Sun zenith angle and mean albedo normalized to overhead Sun. Derivation of these models from the Nimbus 7 ERB (Earth Radiation Budget) and Geostationary Operational Environmental Satellite (GOES) data sets is described. Tabulated values and computer-generated plots are included for the bidirectional and directional modes. Author

**N89-14634\*#** National Aeronautics and Space Administration, Washington, DC.

### SUMMARY OF ALONG-TRACK DATA FROM THE EARTH RADIATION BUDGET SATELLITE FOR SEVERAL REPRESENTATIVE OCEAN REGIONS

DAVID R. BROOKS and MARTA A. FENN (Planning Research Corp., Hampton, Va.) Nov. 1988 216 p (NASA-RP-1206; L-16449; NAS 1.61:1206) Avail: NTIS HC A10/MF A02 CSCL 04B

For several days in January and August 1985, the Earth Radiation Budget Satellite, a component of the Earth Radiation Budget Experiment (ERBE), was operated in an along-track scanning mode. A survey of radiance measurements taken in this mode is given for five ocean regions: the north and south Atlantic, the Arabian Sea, the western Pacific north of the Equator, and part of the Intertropical Convergence Zone. Each overflight contains information about the clear scene and three cloud categories: partly cloudy, mostly cloudy, and overcast. The data presented include the variation of longwave and shortwave radiance in each scene classification as a function of viewing zenith angle during each overflight of one of the five target regions. Several features of interest in the development of anisotropic models are evident, including the azimuthal dependence of shortwave radiance that is an essential feature of shortwave bidirectional models. The data also demonstrate that the scene classification algorithm employed by the ERBE results in scene classifications that are a function of viewing geometry. Author

**N89-14648\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

### USER'S GUIDE FOR THE NIMBUS 7 SCANNING MULTICHANNEL MICROWAVE RADIOMETER (SMMR) CELL-ALL TAPE

C. C. CU, D. HAN, S. T. KIM (ST Systems Corp., Lanham, Md.), and P. GLOERSEN Oct. 1988 152 p (NAS5-29386)

(NASA-RP-1210; REPT-88-181; NAS 1.61:1210) Avail: NTIS HC A08/MF A01 CSCL 04B

The SMMR instrument onboard the Nimbus-7 satellite has been in operation since October 1978. It provided global coverage of passive microwave observations at 6.6, 10.7, 18, 21, and 37 GHz. The observed brightness temperature can be used to retrieve geophysical parameters, principally sea surface temperature, atmospheric water vapor and liquid water content over oceans, sea ice concentration, and snow cover over land. The SMMR CELL-ALL Tape contains earth-located calibrated brightness temperature data which have been appropriately binned into cells of various grid sizes, allowing intercomparisons of observations made at different frequencies (with corresponding different footprint sizes). This user's guide describes the operation of the instrument, the flow of the data processing the calibration procedure, and the characteristics of the calibrated brightness temperatures and how they are binned. Detailed tape specifications and lists of available data are also provided. Author

**N89-17374\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### LIMB-DARKENING FUNCTIONS AS DERIVED FROM ALONG-TRACK OPERATION OF THE ERBE SCANNING RADIOMETER FOR JANUARY 1985

G. LOUIS SMITH, NATIVIDAD MANALO, JOHN T. SUTTLES, and IRA WALKER (Planning Research Corp., Hampton, VA.)

Washington, DC Mar. 1989 26 p  
(NASA-RP-1214; L-16487; NAS 1.61:1214) Avail: NTIS HC  
A03/MF A01 CSCL 04B

During January 1985, the scanning radiometer aboard the Earth Radiation Budget Satellite was operated to scan along-track. These data have been analyzed to produce limb-darkening functions for Earth emitted radiation, which relate the radiance in any given direction to the radiant exitance. Limb-darkening functions are presented in tabular form and shown as figures for 10 day cases and 12 night cases, corresponding to various scene types and latitude zones. The scene types were computed using measurements within 10 deg of zenith. The limb-darkening functions have values of 1.03 to 1.09 at zenith, with 1.06 being typical. It is found that latitude causes a variation on the order of 1 percent, except for zenith angles greater than 70 deg. These limb-darkening models are about 2 percent higher at zenith than the models derived from Nimbus 7 data. Author

**N89-20587\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ANGULAR RADIATION MODELS FOR EARTH-ATMOSPHERE SYSTEM. VOLUME 2: LONGWAVE RADIATION**

J. T. SUTTLES, R. N. GREEN, G. L. SMITH, B. A. WIELICKI, I. J. WALKER, V. R. TAYLOR, and L. L. STOWE (National Oceanic and Atmospheric Administration, Washington, DC.) Apr. 1989 88 p

(NASA-RP-1184-VOL-2; L-16503; NAS 1.61:1184-VOL-2) Avail: NTIS HC A05/MF A01 CSCL 04B

The longwave angular radiation models that are required for analysis of satellite measurements of Earth radiation, such as those from the Earth Radiation Budget Experiment (ERBE) are presented. The models contain limb-darkening characteristics and mean fluxes. Limb-darkening characteristics are the longwave anisotropic factor and the standard deviation of the longwave radiance. Derivation of these models from the Nimbus 7 ERB (Earth Radiation Budget) data set is described. Tabulated values and computer-generated plots are included for the limb-darkening and mean-flux models. Author

**N89-20588\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**AN ASSESSMENT MODEL FOR ATMOSPHERIC COMPOSITION**

MICHAEL J. PRATHER, ed. Jan. 1988 56 p Proceedings of a workshop held at NASA Goddard Inst. for Space Studies, New York, NY, 10-13 Jan. 1988

(NASA-CP-3023; REPT-89-31; NAS 1.55:3023) Avail: NTIS HC A04/MF A01 CSCL 04B

AIR QUALITY, ATMOSPHERIC COMPOSITION, EARTH ATMOSPHERE, ENVIRONMENTAL MONITORING, PHOTOCHEMICAL OXIDANTS

**N89-27302\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**THE 1989 AIRBORNE ARCTIC STRATOSPHERIC EXPEDITION NIMBUS-7 TOMS DATA ATLAS**

ARLIN J. KRUEGER, LANNING M. PENN, DAVID E. LARKO, SCOTT D. DOIRON, and PATRICIA T. GUIMARAES (ST Systems Corp., Vienna, VA.) Washington Jul. 1989 154 p  
(NAS5-29373)

(NASA-RP-1227; REPT-89B00188; NAS 1.61:1227) Avail: NTIS HC A08/MF A01 CSCL 04B

Over the past several years, world scientific attention was focused on the rapid and unanticipated decrease in the abundance of ozone over Antarctica during the Austral spring. A major aircraft campaign was conducted from December 1988 to February 1989 in response to the recently published Ozone Trends Panel Report which found that the largest decreases in Arctic ozone occurred during January to February at latitudes near the edge of the Arctic vortex. This atlas provides a complete set of TOMS ozone measurements over Europe and the North Atlantic for the duration of the experiment. These were the orbital TOMS measurements provided to the experimenters in near-real-time. In addition, a set

of Northern Hemisphere TOMS ozone measurements for the period December 26, 1988 to March 20, 1989 is presented. A comparison of January and February 1989 mean ozone values to prior years is also presented. Author

**N89-28983\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**THE 1988 ANTARCTIC OZONE MONITORING NIMBUS-7 TOMS DATA ATLAS**

ARLIN J. KRUEGER, LANNING M. PENN, DAVID E. LARKO, SCOTT D. DOIRON, and PATRICIA T. GUIMARAES (ST Systems Corp., Vienna, VA.) Aug. 1989 153 p  
(NAS5-29375)

(NASA-RP-1225; REPT-89B00176; NAS 1.61:1225) Avail: NTIS HC A08/MF A01 CSCL 04B

Because of the great environmental significance of ozone and to support continuing research at McMurdo, Syowa, and other Southern Hemisphere stations, the development of the 1988 ozone hole was monitored using data from the Nimbus-7 Total Ozone Mapping Spectrometer (TOMS) instrument, produced in near-real-time. This Atlas provides a complete set of daily polar orthographic projections of the TOMS total ozone measurements over the Southern Hemisphere for the period August 1 through November 17, 1988. Although total ozone in mini-holes briefly dropped below 150 DU in late August, the main ozone hole is seen to be much less pronounced than in 1987. Minimum values, observed in late September and early October 1988, were seldom less than 175 DU. Compared with the same period in 1987, when a pronounced ozone hole whose minimum value of 109 Dobson Units (DU) was the lowest total ozone ever observed, the 1988 ozone hole is displaced from the South Pole, opposing a persistent maximum with values consistently above 500 DU. Daily ozone values above selected Southern Hemisphere stations are presented, along with comparisons of the 1988 ozone distribution to that of other years. Author

**N90-14741\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ATLAS OF ALBEDO AND ABSORBED SOLAR RADIATION DERIVED FROM NIMBUS 6 EARTH RADIATION BUDGET DATA SET, JULY 1975 TO MAY 1978**

G. LOUIS SMITH, T. DALE BESS, and DAVID RUTAN (PRC Kentron, Inc., Hampton, VA.) 1989 88 p  
(NASA-RP-1230; L-16601; NAS 1.61:1230) Avail: NTIS HC A05/MF A01 CSCL 04B

An atlas of monthly mean global contour maps of albedo and absorbed solar radiation is presented. The atlas is based on 35 months of continuous measurements from July 1975 through May 1978. The data were retrieved from measurements made by the shortwave wide field-of-view radiometer of the first Earth Radiation Budget (ERB) instrument, which flew on the Nimbus 6 spacecraft in 1975. Profiles of zonal mean albedos and absorbed solar radiation are tabulated. These geographical distributions are provided as a resource for studying the radiation budget of the earth. This atlas of albedo and absorbed solar radiation complements the atlases of outgoing longwave radiation by Bess and Smith in NASA-RP-1185 and RP-1186, also based on the Nimbus 6 and 7 ERB data. Author

**N90-17233\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ATLAS OF ALBEDO AND ABSORBED SOLAR RADIATION DERIVED FROM NIMBUS 7 EARTH RADIATION BUDGET DATA SET, NOVEMBER 1978 TO OCTOBER 1985**

G. LOUIS SMITH, DAVID RUTAN (PRC Kentron, Inc., Hampton, VA.), and T. DALE BESS Washington Jan. 1990 213 p  
(NASA-RP-1231; L-16591; NAS 1.61:1231) Avail: NTIS HC A10/MF A02 CSCL 04B

An atlas of monthly mean global contour maps of albedo and absorbed solar radiation is presented. This atlas contains 7 years of continuous data from November 1978 through October 1985. The data were retrieved from measurements made by the second Earth Radiation Budget (ERB) wide field-of-view instrument, which

## 47 METEOROLOGY AND CLIMATOLOGY

flew on the Nimbus 7 spacecraft in 1978. The deconvolution method used to produce these data is briefly discussed here so that the user may understand their generation and limitations. These geographical distributions of albedo and absorbed solar radiation are provided as a resource for researchers studying the radiation budget of the Earth. This atlas of albedo and absorbed solar radiation complements the atlases of outgoing longwave radiation by Bess and Smith, also based on the Nimbus 6 and 7 ERB data.  
Author

**N90-19718\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **SPANWISE MEASUREMENTS OF VERTICAL COMPONENTS OF ATMOSPHERIC TURBULENCE**

ROBERT K. SLEEPER Washington Apr. 1990 67 p  
(NASA-TP-2963; L-16550; NAS 1.60:2963) Avail: NTIS HC A04/MF A01 CSCL 04B

AUTOCORRELATION, CROSS CORRELATION, FLOW DISTRIBUTION, GUSTS, VERTICAL AIR CURRENTS, WIND VELOCITY

**N90-23837\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

### **NIMBUS-7 TOMS ANTARCTIC OZONE ATLAS: AUGUST THROUGH NOVEMBER, 1989**

ARLIN J. KRUEGER, LANNING M. PENN, DAVID E. LARKO, SCOTT D. DOIRON, and PATRICIA T. GUIMARAES (ST Systems Corp., Vienna, VA.) Jul. 1990 176 p  
(NAS5-29373)

(NASA-RP-1237; NAS 1.61:1237; REPT-90B00114) Avail: NTIS HC A09/MF A01 CSCL 04B

Because of the great environmental significance of ozone and to support continuing research at the Antarctic and other Southern Hemisphere stations, the development of the 1989 ozone hole was monitored using data from the Nimbus-7 Total Ozone Mapping Spectrometer (TOMS) instrument, produced in near-real-time. This Atlas provides a complete set of daily polar orthographic projections of the TOMS total ozone measurements over the Southern Hemisphere for the period August 1 through November 30, 1989. The 1989 ozone hole developed in a manner similar to that of 1987, reaching a comparable depth in early October. This was in sharp contrast to the much weaker hole of 1988. The 1989 ozone hole remained at polar latitudes as it filled in November, in contrast to other recent years when the hole drifted to mid-latitudes before disappearing. Daily ozone values above selected Southern Hemisphere stations are presented, along with comparisons of the 1989 ozone distribution to that of other years.  
Author

**N90-28224\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **FIRE SCIENCE RESULTS 1989**

DAVID S. MCDUGAL, ed. Washington Jul. 1990 434 p  
Meeting held in Monterey, CA, 10-14 Jul. 1989; sponsored in cooperation with NASA, NSF, ONR, DOE, AFGL, and NOAA  
(NASA-CP-3079; L-16792; NAS 1.55:3079) Avail: NTIS HC A19/MF A03 CSCL 04B

CIRRUS CLOUDS, CLIMATOLOGY, CLOUDS (METEOROLOGY), CONFERENCES, MARINE METEOROLOGY, OPTICAL PROPERTIES, REMOTE SENSING, STRATOCUMULUS CLOUDS, THERMODYNAMIC PROPERTIES

## 48

### OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources.

**N87-24870\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

### **ARCTIC SEA ICE, 1973-1976: SATELLITE PASSIVE-MICROWAVE OBSERVATIONS**

CLAIRE L. PARKINSON, JOSEFINO C. COMISO, H. JAY ZWALLY, DONALD J. CAVALIERI, PER GLOERSEN, and WILLIAM J. CAMPBELL (Puget Sound Univ., Tacoma, Wash.) Jan. 1987 301 p Original contains color illustrations  
(NASA-SP-489; NAS 1.21:489; LC-86-23876) Avail: NTIS HC A14 CSCL 08L

The Arctic region plays a key role in the climate of the earth. The sea ice cover affects the radiative balance of the earth and radically changes the fluxes of heat between the atmosphere and the ocean. The observations of the Arctic made by the Electrically Scanning Microwave Radiometer (ESMR) on board the Nimbus 5 research satellite are summarized for the period 1973 through 1976.  
B.G.

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### LIFE SCIENCES (GENERAL)

**N87-20727\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **LIQUID DROP STABILITY FOR PROTEIN CRYSTAL GROWTH IN MICROGRAVITY**

ROBERT B. OWEN, BETH H. BROOM, ROBERT S. SNYDER, and RON DANIEL Apr. 1987 17 p  
(NASA-TP-2724; NAS 1.60:2724) Avail: NTIS HC A03/MF A01 CSCL 06B

DROPS (LIQUIDS), MICROGRAVITY APPLICATIONS, PROTEIN CRYSTAL GROWTH, PROTEIN SYNTHESIS, STABILITY

**N88-15354\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

### **MICROGRAVITY PARTICLE RESEARCH ON THE SPACE STATION**

STEVEN W. SQUYRES, ed., CHRISTOPHER P. MCKAY, ed., and DEBORAH E. SCHWARTZ, ed. Dec. 1987 48 p Workshop held in Moffett Field, Calif., 22-24 Aug. 1985  
(NASA-CP-2496; A-87361; NAS 1.55:2496) Avail: NTIS HC A03/MF A01 CSCL 06B

PARTICLES, REDUCED GRAVITY, SPACE STATION PAYLOADS, SPACEBORNE EXPERIMENTS

**N88-17168\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

### **SPACE BIOREACTOR SCIENCE WORKSHOP**

DENNIS R. MORRISON, ed. Dec. 1987 183 p Workshop held in Houston, Tex., 22-23 Aug. 1985  
(NASA-CP-2485; S-564; NAS 1.55:2485) Avail: NTIS HC A09/MF A02 CSCL 06B

BIOPROCESSING, BIOREACTORS, BIOTECHNOLOGY, CELLS (BIOLOGY), CONFERENCES, CULTURE TECHNIQUES, REDUCED GRAVITY, SPACE PROCESSING, TISSUES (BIOLOGY)



**N88-19883\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**SPACE STATION HUMAN FACTORS RESEARCH REVIEW. VOLUME 3: SPACE STATION HABITABILITY AND FUNCTION: ARCHITECTURAL RESEARCH**  
 MARC M. COHEN, ed., ALICE EICHHOLD, ed., and SUSAN HEERS, ed. Oct. 1987 211 p Workshop held at Moffett Field, Calif., 3-6 Dec. 1985  
 (NASA-CP-2426-VOL-3; A-86263-VOL-3; NAS 1.55:2426-VOL-3)  
 Avail: NTIS HC A10/MF A02 CSCL 05H  
 ARCHITECTURE, HUMAN FACTORS ENGINEERING, SPACE STATIONS, SPACECRAFT DESIGN

**N88-24145\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**SPACE STATION HUMAN FACTORS RESEARCH REVIEW. VOLUME 1: EVA RESEARCH AND DEVELOPMENT**  
 MARC M. COHEN, ed. and H. C. VYKUKAL, ed. Apr. 1988 136 p Workshop held at Moffett Field, Calif., 3-6 Dec. 1985  
 (NASA-CP-2426-VOL-1; A-87163-VOL-1; NAS 1.55:2426-VOL-1)  
 Avail: NTIS HC A07/MF A01 CSCL 06B  
 CONFERENCES, EXTRAVEHICULAR ACTIVITY, HUMAN FACTORS ENGINEERING, SPACE STATIONS

**N88-24148\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**SPACE STATION HUMAN FACTORS RESEARCH REVIEW. VOLUME 4: INHOUSE ADVANCED DEVELOPMENT AND RESEARCH**  
 TRIEVE TANNER, ed., YVONNE A. CLEARWATER, ed., and MARC M. COHEN, ed. May 1988 135 p Workshop held at Moffett Field, Calif., 3-6 Dec. 1985  
 (NASA-CP-2426-VOL-4; A-87247-VOL-4; NAS 1.55:2426-VOL-4)  
 Avail: NTIS HC A07/MF A01 CSCL 06B  
 HUMAN FACTORS ENGINEERING, SPACE STATIONS, SPACECRAFT DESIGN

**N89-17997\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**PROCEEDINGS OF A CONFERENCE ON CARDIOVASCULAR BIOINSTRUMENTATION**  
 RODNEY W. BALLARD, CHARLES A. FULLER, RICHARD MAINS, and HERBERT J. FINGER Dec. 1988 71 p Conference held at Moffett Field, CA, 21-22 Jul. 1987  
 (NASA-CP-10022; A-88120; NAS 1.55:10022) Avail: NTIS HC A04/MF A01 CSCL 06C  
 BIOINSTRUMENTATION, CARDIOVASCULAR SYSTEM, CONFERENCES, GROUND SUPPORT SYSTEMS, MANNED SPACE FLIGHT

**N89-24022\*#** General Electric Co., Moffett Field, CA.  
**GAS-GRAIN SIMULATION FACILITY: FUNDAMENTAL STUDIES OF PARTICLE FORMATION AND INTERACTIONS. VOLUME 1: EXECUTIVE SUMMARY AND OVERVIEW**  
 GUY FOGLEMAN, ed., JUDITH L. HUNTINGTON, ed. (Search for Extraterrestrial Intelligence Inst., Los Altos, CA.), DEBORAH E. SCHWARTZ, ed., and MARK L. FONDA, ed. Mar. 1989 38 p Presented at the Gas-Grain Simulation Facility Experiments Workshop, Sunnyvale, CA, 31 Aug. - 1 Sep. 1987; sponsored by the Exobiology Flight Program  
 (NASA-CP-10026-VOL-1; A-88256-VOL-1; NAS 1.55:10026-VOL-1) Avail: NTIS HC A03/MF A01 CSCL 06C  
 AEROSOLS, CLOUDS, COSMIC DUST, GRAINS, GRAVITATIONAL EFFECTS, NUCLEATION, PARTICLE INTERACTIONS, PARTICLES, PARTICULATES, REDUCED GRAVITY, SPACE LABORATORIES, SPACE STATION PAYLOADS, SPACEBORNE EXPERIMENTS

**N89-24023\*#** General Electric Co., Moffett Field, CA.  
**GAS-GRAIN SIMULATION FACILITY: FUNDAMENTAL STUDIES OF PARTICLE FORMATION AND INTERACTIONS. VOLUME 2: ABSTRACTS, CANDIDATE EXPERIMENTS AND FEASIBILITY STUDY**

GUY FOGLEMAN, ed., JUDITH L. HUNTINGTON, ed. (Search for Extraterrestrial Intelligence Inst., Los Altos, CA.), DEBORAH E. SCHWARTZ, ed., and MARK L. FONDA, ed. Mar. 1989 199 p Presented at the Gas-Grain Simulation Facility Experiments Workshop, Sunnyvale, CA, 31 Aug. - 1 Sep. 1987; sponsored by the Exobiology Flight Program  
 (NASA-CP-10026-VOL-2; A-88256-VOL-2; NAS 1.55:10026-VOL-2) Avail: NTIS HC A09/MF A02 CSCL 06C  
 AEROSOLS, CLOUDS, COSMIC DUST, GRAINS, PARTICLE INTERACTIONS, PARTICLES, PARTICULATES, REDUCED GRAVITY, SPACEBORNE EXPERIMENTS

**N89-26334\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.  
**EXO BIOLOGY AND FUTURE MARS MISSIONS**  
 CHRISTOPHER P. MCKAY, ed. and WANDA DAVIS, L., ed. Washington Mar. 1989 73 p Workshop held in Sunnyvale, CA, Mar. 1988  
 (NASA-CP-10027; A-89098; NAS 1.55:10027) Avail: NTIS HC A04/MF A01 CSCL 03B  
 BIOLOGICAL EVOLUTION, CHEMICAL EVOLUTION, CONFERENCES, ECOLOGY, EXO BIOLOGY, FOSSILS, MARS SAMPLE RETURN MISSIONS, SOILS

## 52

## AEROSPACE MEDICINE

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

**N87-18976\*** National Aeronautics and Space Administration, Washington, DC.  
**AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO THE 1986 ISSUES (SUPPLEMENT 293)**  
 Jan. 1987 251 p  
 (NASA-SP-7011(293); NAS 1.21:7011(293)) Avail: NTIS HC A12 CSCL 06E

This publication is a cumulative index to the abstracts contained in the Supplements 281 through 292 of Aerospace Medicine and Biology: A Continuing Bibliography. It includes seven indexes - subject, personal author, corporate source, foreign technology, contract number, report number, and accession number. Author

**N87-30041\*** National Aeronautics and Space Administration, Washington, DC.  
**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 302)**  
 Oct. 1987 55 p  
 (NASA-SP-7011(302); NAS 1.21:7011(302)) Avail: HC A04 CSCL 06E

This bibliography lists 131 reports, articles, and other documents introduced into the NASA scientific and technical information system in September, 1987. Author

**N88-14623\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.  
**AIRBORNE PARTICULATE MATTER IN SPACECRAFT**  
 Feb. 1988 15 p Presented at a Panel Discussion held in Houston, Tex., 23-24 Jul. 1987  
 (NAS9-17200)  
 (NASA-CP-2499; S-570; NAS 1.55:2499) Avail: NTIS HC A03/MF A01 CSCL 06K  
 AEROSOLS, AEROSPACE ENVIRONMENTS, AIR PURIFICATION, AIR QUALITY, SPACECRAFT DESIGN

**N88-18180\*** National Aeronautics and Space Administration, Washington, DC.

**AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO A CONTINUING BIBLIOGRAPHY (SUPPLEMENT 306)**

Jan. 1988 210 p  
(NASA-SP-7011(306); NAS 1.21:7011(306)) Avail: NTIS HC A10 CSCL 06E

This publication is a cumulative index to the abstracts contained in the Supplements 294 through 305 of Aerospace Medicine and Biology: A Continuing Bibliography. It includes seven indexes - subject, personal author, corporate source, foreign technology, contract number, report number, and accession number. Author

**N88-30281\*** National Aeronautics and Space Administration, Washington, DC.

**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 315)**

Oct. 1988 71 p  
(NASA-SP-7011(315); NAS 1.21:7011(315)) Avail: NTIS HC A04; NTIS standing order as PB88-912300. \$9.00 domestic, \$18.00 foreign CSCL 06E

This bibliography lists 211 reports, articles and other documents introduced into the NASA scientific and technical information system in September, 1988. Author

**N89-29951\*** National Aeronautics and Space Administration, Washington, DC.

**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 327)**

Feb. 1989 53 p  
(NASA-SP-7011(327); NAS 1.21:7011(327)) Avail: NTIS HC A04; NTIS standing order as PB89-912300, \$10.50 domestic, \$21.00 foreign CSCL 06E

This bibliography lists 127 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during August, 1989. Subject coverage includes: aerospace medicine and psychology, life support systems and controlled environments, safety equipment, exobiology and extraterrestrial life, and flight crew behavior and performance. Author

**N90-28963\*** National Aeronautics and Space Administration, Washington, DC.

**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 340)**

Feb. 1989 64 p  
(NASA-SP-7011(340); NAS 1.21:7011(340)) Avail: NTIS HC A03; NTIS standing order as PB90-912300, \$11.50 domestic, \$23.00 foreign CSCL 06E

This bibliography lists 157 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during August 1990. Subject coverage includes: aerospace medicine and psychology, life support systems and controlled environments, safety equipment, exobiology and extraterrestrial life, and flight crew behavior and performance. Author

**N90-28965\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

**JOINT US/USSR STUDY: COMPARISON OF EFFECTS OF HORIZONTAL AND HEAD-DOWN BED REST**

HAROLD SANDLER and ANATOLI I. GRIGORIEV (Institute of Biomedical Problems, Moscow, USSR) Washington Aug. 1990 102 p  
(NASA-TP-3037; A-85177; NAS 1.60:3037) Avail: NTIS HC A06/MF A01 CSCL 06S

BED REST, BIOCHEMISTRY, HEAD DOWN TILT, HYPOKINESIA, LOWER BODY NEGATIVE PRESSURE, PHYSICAL EXERCISE, PHYSIOLOGY, SPACE FLIGHT

## BEHAVIORAL SCIENCES

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

**N88-23370\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**MENTAL-STATE ESTIMATION, 1987**

J. RAYMOND COMSTOCK, JR., comp. May 1988 393 p  
Workshop held in Williamsburg, Va., 3-4 Jun. 1987; sponsored by NASA, Langley Research Center, Hampton, Va. and Old Dominion Univ., Norfolk, Va. Sponsored by NASA, Washington (NASA-CP-2504; L-16420; NAS 1.55:2504) Avail: NTIS HC A17/MF A03 CSCL 05J

BIOMETRICS, ESTIMATING, HUMAN PERFORMANCE, MENTAL PERFORMANCE, OPERATOR PERFORMANCE, PSYCHOMOTOR PERFORMANCE, STRESS (PSYCHOLOGY), WORKLOADS (PSYCHOPHYSIOLOGY), WORKSTATIONS

## MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

**N88-12251\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

**CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: REGENERATIVE LIFE SUPPORT SYSTEMS IN SPACE**

ROBERT D. MACELROY and DAVID T. SMERNOFF (New Hampshire Univ., Durham.) Sep. 1987 153 p The 26th COSPAR Meeting held in Toulouse, France, Jul. 1986 (NCC2-231)

(NASA-CP-2480; A-87256; NAS 1.55:2480) Avail: NTIS HC A08/MF A01 CSCL 06K

ALGAE, CLOSED ECOLOGICAL SYSTEMS, GAS EXCHANGE, VEGETATION GROWTH

**N88-13852\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

**CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM. DESIGN, DEVELOPMENT, AND USE OF A GROUND-BASED PLANT GROWTH MODULE**

ROBERT D. MACELROY, DAVID T. SMERNOFF (New Hampshire Univ., Durham.), and JOHN D. RUMMEL Sep. 1987 83 p Meeting held at Moffett Field, Calif., Sep. 1984, in Cocoa Beach, Fla., Apr. 1985 and in Carmel, Calif., 23-25 Apr. 1986 (NCC2-27)

(NASA-CP-2479; A-87255; NAS 1.55:2479) Avail: NTIS HC A05/MF A01 CSCL 06K

CLOSED ECOLOGICAL SYSTEMS, CROP GROWTH, EXPERIMENT DESIGN, FOOD, LABORATORY EQUIPMENT, PLANTS (BOTANY)

**N89-13898\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

**REPORT OF THE 1ST PLANNING WORKSHOP FOR CELSS FLIGHT EXPERIMENTATION**

JOHN W. TREMOR and ROBERT D. MACELROY 1988 28 p Workshop held at Moffett Field, Calif., 23-24 Mar. 1987 (NASA-CP-10020; A-88265; NAS 1.55:10020) Avail: NTIS HC A03/MF A01 CSCL 05H

BIOASTRONAUTICS, CLOSED ECOLOGICAL SYSTEMS,

CONFERENCES, PLANTS (BOTANY), SPACECRAFT ENVIRONMENTS

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## MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

**N89-18039\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.**INTERACTIVE ORBITAL PROXIMITY OPERATIONS PLANNING SYSTEM**

ARTHUR J. GRUNWALD and STEPHEN R. ELLIS Nov. 1988 48 p

(NASA-TP-2839; A-88091; NAS 1.60:2839) Avail: NTIS HC A03/MF A01 CSCL 05H

COMPUTER GRAPHICS, ORBITAL MANEUVERS, PROXIMITY, SPACE STATIONS, SPACECRAFT TRAJECTORIES

**N90-22918\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.**SPATIAL DISPLAYS AND SPATIAL INSTRUMENTS**

STEPHEN R. ELLIS, ed., MARY K. KAISER, ed., and ARTHUR J. GRUNWALD, ed. (Technion - Israel Inst. of Tech., Haifa.) Jul. 1989 623 p Conference held in Pacific Grove, CA, 31 Aug. - 3 Sep. 1987; sponsored by NASA, Ames Research Center, Moffett Field, CA and California Univ., Berkeley

(NASA-CP-10032; A-88090; NAS 1.55:10032) Avail: NTIS HC A99/MF A04 CSCL 05H

COMPUTER GRAPHICS, CONFERENCES, DISPLAY DEVICES, IMAGE ANALYSIS, SPATIAL RESOLUTION, VISUAL PERCEPTION

**N90-22965\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.**DETERMINATION OF DEPTH-VIEWING VOLUMES FOR STEREO THREE-DIMENSIONAL GRAPHIC DISPLAYS**

RUSSELL V. PARRISH and STEVEN P. WILLIAMS (Army Aviation Systems Command, Saint Louis, MO.) Washington Jun. 1990 21 p

(DA PROJ. 1L1-61102-AH-45)

(NASA-TP-2999; L-16655; NAS 1.60:2999;

AVSCOM-TM-90-B-016) Avail: NTIS HC A03/MF A01 CSCL 05H

COMPUTER GRAPHICS, DEPTH, SPACE PERCEPTION, STEREOSCOPIC VISION, VISUAL SIGNALS

55

## SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

**N90-13939\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.**CELLS IN SPACE**

JEAN D. SIBONGA, ed., RICHARD C. MAINS, ed., THOMAS N. FAST, ed. (Santa Clara Univ., CA.), PAUL X. CALLAHAN, ed., and CHARLES M. WINGET, ed. Aug. 1989 310 p Conference held in San Juan Bautista, CA, 31 Oct. - 4 Nov. 1988

(NASA-CP-10034; A-89131; NAS 1.55:10034) Avail: NTIS HC A14/MF A02 CSCL 06C

CELLS (BIOLOGY), CONFERENCES, EXPERIMENT DESIGN, GRAVITATIONAL EFFECTS, GRAVITATIONAL PHYSIOLOGY, MANNED SPACE FLIGHT, SPACEBORNE EXPERIMENTS

**N88-14629\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.**A GENERAL SOLUTION TO THE SILHOUETTE PROBLEM**

DAVID R. HEDGLEY, JR. Feb. 1987 9 p

(NASA-TP-2695; H-1348; NAS 1.60:2695) Avail: NTIS HC A02/MF A01 CSCL 12A

COMPUTER GRAPHICS, DISPLAY DEVICES, IMAGE ENHANCEMENT, IMAGE PROCESSING

**N88-17206\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.**FIRST ANNUAL WORKSHOP ON SPACE OPERATIONS AUTOMATION AND ROBOTICS (SOAR 87)**

SANDY GRIFFIN, ed. Oct. 1987 530 p Workshop held in Houston, Tex., 5-7 Aug. 1987; sponsored by NASA, Johnson Space Flight Center and the US Air Force

(NASA-CP-2491; S-567; NAS 1.55:2491) Avail: NTIS HC A23/MF A04 CSCL 12B

ARCHITECTURE (COMPUTERS), AUTOMATIC CONTROL, COMPUTER AIDED DESIGN, CONFERENCES, DISTRIBUTED PROCESSING, EXPERT SYSTEMS, LOGISTICS, MAN MACHINE SYSTEMS, NEURAL NETS, PARALLEL PROCESSING (COMPUTERS), ROBOTICS

**N88-21646\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.**CARE 3 USER'S WORKSHOP**

Apr. 1988 160 p Workshop held in Hampton, Va., 6-7 Oct. 1987; sponsored by NASA, Washington

(NASA-CP-10011; NAS 1.55:10011) Avail: NTIS HC A08/MF A01 CSCL 12A

COMPUTER PROGRAMS, CONFERENCES, FAULT TOLERANCE, RELIABILITY ANALYSIS

**N89-19817\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.**SECOND ANNUAL WORKSHOP ON SPACE OPERATIONS AUTOMATION AND ROBOTICS (SOAR 1988)**

SANDY GRIFFIN, ed./comp. Washington, DC Nov. 1988 517 p Workshop held in Dayton, OH, 20-23 Jul. 1988; sponsored by NASA, Johnson Space Flight Center, USAF, Washington, DC, and Wright State Univ., Dayton, OH

(NASA-CP-3019; S-585; NAS 1.55:3019) Avail: NTIS HC A22/MF A04 CSCL 12A

COMPUTER ASSISTED INSTRUCTION, COMPUTER TECHNIQUES, EXPERT SYSTEMS, HUMAN FACTORS ENGINEERING, INFORMATION SYSTEMS, KNOWLEDGE BASES (ARTIFICIAL INTELLIGENCE), ROBOTICS, SYSTEMS INTEGRATION, TELEOPERATORS

**N90-21524\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.**A TIME-ACCURATE ADAPTIVE GRID METHOD AND THE NUMERICAL SIMULATION OF A SHOCK-VORTEX INTERACTION**

MICHAEL J. BOCKELIE and PETER R. EISEMAN (Columbia Univ., New York, NY.) Washington Jun. 1990 20 p

(NAG1-427; AF-AFOSR-0307-86) (NASA-TP-2998; L-16727; NAS 1.60:2998) Avail: NTIS HC A03/MF A01 CSCL 12A

COMPUTATIONAL GRIDS, COMPUTERIZED SIMULATION, GRID GENERATION (MATHEMATICS), SHOCK WAVE INTERACTION, VORTICES

## 59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

**N90-25503\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

### **THIRD ANNUAL WORKSHOP ON SPACE OPERATIONS AUTOMATION AND ROBOTICS (SOAR 1989)**

SANDY GRIFFIN, ed. Washington Mar. 1990 651 p Workshop held in Houston, TX, 25-27 Jul. 1989; sponsored by NASA, Washington, the AF, and Houston-Clear Lake Univ. (NASA-CP-3059; S-599; NAS 1.55:3059) Avail: NTIS HC A99/MF A04 CSCL 12A

AEROSPACE ENVIRONMENTS, AUTOMATIC CONTROL, CONFERENCES, END EFFECTORS, EXPERT SYSTEMS, HUMAN FACTORS ENGINEERING, KNOWLEDGE BASES (ARTIFICIAL INTELLIGENCE), MANIPULATORS, ROBOTICS, ROBOTS, SPACE STATIONS, SPACECRAFT CONTAMINATION, TELEOPERATORS

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### **COMPUTER OPERATIONS AND HARDWARE**

Includes hardware for computer graphics, firmware, and data processing.

**N78-74659\*** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **THE MSFC/UAH DATA MANAGEMENT SYMPOSIUM**

A. CASTELLI, ed. 16 Feb. 1978 423 p refs Symp. held at Huntsville, Ala., 18-19 Oct. 1977 (NASA-CP-2040)

ALABAMA, CONFERENCES, DATA MANAGEMENT, NASA PROGRAMS, UNIVERSITIES

**N88-20833\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **DIGITAL ENHANCEMENT OF FLOW FIELD IMAGES**

ROBERT A. KUDLINSKI and STEPHEN K. PARK Mar. 1988 25 p Original contains color illustrations (NASA-TP-2770; L-16318; NAS 1.60:2770) Avail: NTIS HC A03/MF A01 CSCL 09B

DIGITAL TECHNIQUES, FLOW VISUALIZATION, IMAGE ENHANCEMENT, IMAGE PROCESSING, PHOTOGRAPHIC PROCESSING

**N90-20651\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

### **GRAPHICS TECHNOLOGY IN SPACE APPLICATIONS (GTSA 1989)**

SANDY GRIFFIN, ed. Aug. 1989 247 p Workshop held in Houston, TX, 12-14 Apr. 1989; sponsored by NASA, Washington and Houston Univ., Clear Lake (NASA-CP-3045; S-594; NAS 1.55:3045) Avail: NTIS HC A11/MF A02 CSCL 09B

COMPUTER ANIMATION, COMPUTER GRAPHICS, CONFERENCES, DISPLAY DEVICES, MAN MACHINE SYSTEMS, SPACE SHUTTLES, SPACE STATIONS, SYSTEMS SIMULATION, TELEOPERATORS, TRAINING SIMULATORS

## 61

### **COMPUTER PROGRAMMING AND SOFTWARE**

Includes computer programs, routines, and algorithms, and specific applications, e.g., CAD/CAM.

**N87-10720\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

### **PROCEEDINGS OF THE 5TH ANNUAL USERS' CONFERENCE**

M. SZCZUR, ed. and E. HARRIS, ed. 1985 400 p Conference held at Greenbelt, Md., 4-6 Jun. 1985 (NASA-CP-2399; NAS 1.55:2399) Avail: NTIS HC A17/MF A03 CSCL 09B

ACCESS CONTROL, COMPUTER NETWORKS, FORMAT, IMAGE PROCESSING, SOFTWARE ENGINEERING, SOFTWARE TOOLS, SPACE STATIONS

**N87-19931\*#** National Aeronautics and Space Administration, Washington, DC.

### **COMPUTER SCIENCES AND DATA SYSTEMS, VOLUME 1**

Mar. 1987 356 p Proceedings of a Symposium held in Williamsburg, Va., 18-20 Nov. 1986 (NASA-CP-2459-VOL-1; NAS 1.55:2459-VOL-1) Avail: NTIS HC A16/MF A02 CSCL 09B

ARCHITECTURE (COMPUTERS), CONCURRENT PROCESSING, CONFERENCES, DATA MANAGEMENT, DISTRIBUTED PROCESSING, EXPERT SYSTEMS, SOFTWARE ENGINEERING

**N87-19932\*#** National Aeronautics and Space Administration, Washington, DC.

### **COMPUTER SCIENCES AND DATA SYSTEMS, VOLUME 2**

Mar. 1987 339 p Proceedings of a Symposium held in Williamsburg, Va., 18-20 Nov. 1986 (NASA-CP-2459-VOL-2; NAS 1.55:2459-VOL-2) Avail: NTIS HC A15/MF A02 CSCL 09B

CONFERENCES, DATA STORAGE, DISTRIBUTED PROCESSING, FIBER OPTICS, MASSIVELY PARALLEL PROCESSORS, OPTICAL DATA PROCESSING, PARALLEL PROCESSING (COMPUTERS), VHSIC (CIRCUITS)

**N87-23156\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

### **SIXTH ANNUAL USERS' CONFERENCE**

MARTHA SZCZUR, ed. and ELFRIEDA HARRIS, ed. (Science Applications Research, Lanham, Md.) Oct. 1986 228 p Conference held in Pasadena, Calif., 8-10 Oct. 1986; sponsored by JPL and NASA. Goddard Space Flight Center (NASA-CP-2463; REPT-87B0176; NAS 1.55:2463) Avail: NTIS HC A11/MF A02 CSCL 09B

APPLICATIONS PROGRAMS (COMPUTERS), COMPUTER SYSTEMS PROGRAMS, CONFERENCES, IMAGE PROCESSING, INFORMATION SYSTEMS, MAN-COMPUTER INTERFACE, OPERATING SYSTEMS (COMPUTERS)

**N87-26531\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

### **FRONTIERS OF MASSIVELY PARALLEL SCIENTIFIC COMPUTATION**

JAMES R. FISCHER, ed. Jul. 1987 293 p Symposium held in Greenbelt, Md., 24-25 Sep. 1986; sponsored by NASA Goddard Space Flight Center and Goodyear Aerospace Corp. (NASA-CP-2478; REPT-87B9876; NAS 1.55:2478) Avail: NTIS HC A13/MF A02 CSCL 09B

ALGORITHMS, COMPUTER GRAPHICS, COMPUTER SYSTEMS PERFORMANCE, COMPUTERIZED SIMULATION, MASSIVELY PARALLEL PROCESSORS, PARALLEL PROCESSING (COMPUTERS)

**N88-16360\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **THIRD CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR SPACE APPLICATIONS, PART 1**

JUDITH S. DENTON, comp., MICHAEL S. FREEMAN, comp., and MARY VEREEN, comp. Nov. 1987 421 p Conference held in Huntsville, Ala., 2-3 Nov. 1987; sponsored by NASA, Marshall Space Flight Center, Huntsville, Ala. and Alabama Univ., Huntsville (NASA-CP-2492-Pt-1; M-575-PT-1; NAS 1.55:2492-Pt-1) Avail: NTIS HC A18/MF A03 CSCL 09B

COMPUTER PROGRAMS, CONFERENCES, DATA BASE

## 61 COMPUTER PROGRAMMING AND SOFTWARE

MANAGEMENT SYSTEMS, EXPERT SYSTEMS, KNOWLEDGE, MAN MACHINE SYSTEMS, ROBOTICS, SCHEDULING, SPACE SHUTTLES, SPACE STATIONS, SPACECRAFT CONTROL

**N88-24188\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **THIRD CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR SPACE APPLICATIONS, PART 2**

JUDITH S. DENTON, comp., MICHAEL S. FREEMAN, comp., and MARY VEREEN, comp. Jun. 1988 66 p Conference held in Huntsville, Ala., 2-3 Nov. 1987; sponsored by NASA, Marshall Space Flight Center, Huntsville, Ala. and Alabama Univ., Huntsville Sponsored by NASA, Washington (NASA-CP-2492-PT-2; M-576-PT-2; NAS 1.55:2492-PT-2) Avail: NTIS HC A04/MF A01 CSCL 09B

COMPUTER PROGRAMS, CONFERENCES, EXPERT SYSTEMS, SOFTWARE TOOLS, SPACE STATIONS

**N88-29351\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **SECOND CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR SPACE APPLICATIONS**

THOMAS DOLLMAN, comp. Aug. 1988 709 p Conference held in Huntsville, Ala., 13-14 Nov. 1986; sponsored by NASA, Marshall Space Flight Center, Huntsville, Ala. and Alabama Univ., Huntsville Sponsored by NASA, Washington, D.C. (NASA-CP-3007; M-577; NAS 1.55:3007) Avail: NTIS HC A99/MF A04 CSCL 09B

AUTOMATIC CONTROL, COMPUTER AIDED DESIGN, COMPUTER VISION, EXPERT SYSTEMS, ROBOTICS, SPACE STATIONS

**N89-11407\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **OEXP ANALYSIS TOOLS WORKSHOP**

L. BERNARD GARRETT, ROBERT L. WRIGHT, DEBORAH BADI, and JOHN T. FINDLAY (Flight Mechanics and Control, Inc., Hampton, Va.) Aug. 1988 146 p Workshop held in Hampton, Va., 21-22 Jun. 1988 Sponsored by NASA, Washington, D.C. (NASA-CP-10013; NAS 1.55:10013) Avail: NTIS HC A07/MF A01 CSCL 09B

COMPUTER PROGRAMS, LUNAR EXPLORATION, MARS LANDING, MISSION PLANNING, SOFTWARE TOOLS

**N89-12237\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **ANALYSIS OF POSITRON LIFETIME SPECTRA IN POLYMERS**

JAG J. SINGH, GERALD H. MALL (Computer Sciences Corp., Hampton, Va.), and DANNY R. SPRINKLE Dec. 1988 61 p (NASA-TP-2853; L-16468; NAS 1.60:2853) Avail: NTIS HC A04/MF A01 CSCL 09B

COMPUTER PROGRAMS, EPOXY COMPOUNDS, HALF LIFE, POSITRONS, RADIATION SPECTRA

**N89-13994\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **THE ESTIMATION ERROR COVARIANCE MATRIX FOR THE IDEAL STATE RECONSTRUCTOR WITH MEASUREMENT NOISE**

MICHAEL E. POLITES Dec. 1988 19 p (NASA-TP-2881; NAS 1.60:2881) Avail: NTIS HC A03/MF A01 CSCL 09B

COVARIANCE, ERROR ANALYSIS, MATRICES (MATHEMATICS), RECONSTRUCTION, STATE ESTIMATION

**N89-15549\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **FOURTH CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR SPACE APPLICATIONS**

STEPHEN L. ODELL, comp., JUDITH S. DENTON, comp., and MARY VEREEN, comp. Oct. 1988 485 p Conference held in Huntsville, AL, 15-16 Nov. 1988; sponsored by NASA and Alabama Univ., Huntsville

(NASA-CP-3013; M-599; NAS 1.55:3013) Avail: NTIS HC A21/MF A03 CSCL 09B

AEROSPACE SCIENCES, ARTIFICIAL INTELLIGENCE, EXPERT SYSTEMS, ROBOTICS

**N89-22332\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

### **PROCEEDINGS OF THE SCIENTIFIC DATA COMPRESSION WORKSHOP**

H. K. RAMAPRIYAN, ed. Washington, DC Feb. 1989 448 p Workshop held in Snowbird, UT, 3-5 May 1988; sponsored by NASA, Washington (NASA-CP-3025; REPT-89B0038; NAS 1.55:3025) Avail: NTIS HC A19/MF A03 CSCL 09B

CONFERENCES, DATA COMPRESSION, DATA MANAGEMENT, DATA TRANSMISSION, IMAGE PROCESSING, IMAGING TECHNIQUES, SIGNAL PROCESSING, TELEMETRY, VECTORS (MATHEMATICS)

**N89-23181\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **A KNOWLEDGE-BASED TOOL FOR MULTILEVEL DECOMPOSITION OF A COMPLEX DESIGN PROBLEM**

JAMES L. ROGERS Washington May 1989 23 p (NASA-TP-2903; L-16557; NAS 1.60:2903) Avail: NTIS HC A03/MF A01 CSCL 09B

COMPUTER AIDED DESIGN, KNOWLEDGE BASES (ARTIFICIAL INTELLIGENCE), SCHEDULING, SOFTWARE TOOLS, SYSTEMS ENGINEERING

**N90-11454\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **APPLICATIONS OF THE HYBRID AUTOMATED RELIABILITY PREDICTOR: REVISED EDITION**

SALVATORE J. BAVUSO, JOANNE BECHTA DUGAN, KISHOR TRIVEDI, BETH ROTHMANN, and MARK BOYD (Duke Univ., Durham, NC.) Dec. 1988 30 p (NASA-TP-2760-REV; L-16304; NAS 1.60:2760-REV) Avail: NTIS HC A03/MF A01 CSCL 09B

APPLICATIONS PROGRAMS (COMPUTERS), COMPUTER TECHNIQUES, FAULT TOLERANCE, PREDICTIONS, RELIABILITY

**N90-14789\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **SOFTWARE REUSE ISSUES**

SUSAN J. VOIGT, ed. and KATHRYN A. SMITH, ed. Washington Dec. 1989 168 p Workshop held in Melbourne, FL, 17-18 Nov. 1988 (NASA-CP-3057; L-16667; NAS 1.55:3057) Avail: NTIS HC A08/MF A01 CSCL 09B

COMPUTER PROGRAMS, CONFERENCES, SOFTWARE ENGINEERING, SOFTWARE TOOLS, SPACE STATIONS

**N90-18882\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **LOW-ENERGY GAMMA RAY ATTENUATION CHARACTERISTICS OF AVIATION FUELS**

JAG J. SINGH, CHIH-PING SHEN (Old Dominion Univ., Norfolk, VA.), and DANNY R. SPRINKLE Washington Mar. 1990 40 p (NASA-TP-2974; L-16719; NAS 1.60:2974) Avail: NTIS HC A03/MF A01 CSCL 09B

AIRCRAFT FUELS, AIRPORTS, ENERGY ABSORPTION, FUEL SYSTEMS, GAMMA RAY ABSORPTION, GAMMA RAYS

**N90-27275\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

### **FIFTH CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR SPACE APPLICATIONS**

STEVE L. ODELL, comp. Washington May 1990 587 p Conference held in Huntsville, AL, 22-23 May 1990; sponsored in cooperation with Alabama Univ., Huntsville, IEEE, and AIAA

## 62 COMPUTER SYSTEMS

(NASA-CP-3073; M-627; NAS 1.55:3073) Avail: NTIS HC A25/MF A04 CSCL 09B  
ARTIFICIAL INTELLIGENCE, AUTOMATIC CONTROL, CONFERENCES, KNOWLEDGE BASES (ARTIFICIAL INTELLIGENCE), ROBOTICS

62

### COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

**N87-23202\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**APPLICATIONS AND REQUIREMENTS FOR REAL-TIME SIMULATORS IN GROUND-TEST FACILITIES**  
DALE J. ARPASI and RICHARD A. BLECH Dec. 1986 26 p (NASA-TP-2672; E-3189; NAS 1.60:2672) Avail: NTIS HC A03/MF A01 CSCL 09B  
GROUND TESTS, REAL TIME OPERATION, SIMULATORS, TEST FACILITIES

**N89-17422\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**PARALLEL GAUSSIAN ELIMINATION OF A BLOCK TRIDIAGONAL MATRIX USING MULTIPLE MICROCOMPUTERS**  
RICHARD A. BLECH Washington, DC Feb. 1989 35 p (NASA-TP-2892; E-4199; NAS 1.60:2892) Avail: NTIS HC A03/MF A01 CSCL 09B  
GAUSSIAN ELIMINATION, MATRICES (MATHEMATICS), MICROCOMPUTERS, MULTIPROCESSING (COMPUTERS), PARALLEL PROGRAMMING

**N89-24815\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**THE FAULT TREE COMPILER (FTC): PROGRAM AND MATHEMATICS**  
RICKY W. BUTLER and ANNA L. MARTENSEN (PRC Kentron, Inc., Hampton, VA.) Washington Jul. 1989 40 p (NASA-TP-2915; L-16529; NAS 1.60:2915) Avail: NTIS HC A03/MF A01 CSCL 09B  
COMPUTER PROGRAMS, COMPUTER TECHNIQUES, FAULT TOLERANCE, FAULT TREES, PROBABILITY THEORY, RELIABILITY ANALYSIS

63

### CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

**N88-30330\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**THE 1988 GODDARD CONFERENCE ON SPACE APPLICATIONS OF ARTIFICIAL INTELLIGENCE**  
JAMES RASH, ed. and PETER HUGHES, ed. Aug. 1988 437 p Conference held in Greenbelt, Md., 24 May 1988 Sponsored by NASA, Washington, D.C. (NASA-CP-3009; REPT-88B0212; NAS 1.55:3009) Avail: NTIS HC A19/MF A03 CSCL 09B  
AEROSPACE ENGINEERING, ARTIFICIAL INTELLIGENCE, COMPUTERIZED SIMULATION, CONFERENCES, EXPERT SYSTEMS, IMAGE PROCESSING, MISSION PLANNING

**N89-26578\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**THE 1989 GODDARD CONFERENCE ON SPACE APPLICATIONS OF ARTIFICIAL INTELLIGENCE**  
JAMES RASH, ed. Washington Apr. 1989 385 p Conference held in Greenbelt, MD, 16-17 May 1989 (NASA-CP-3033; REPT-89B00099; NAS 1.55:3033) Avail: NTIS HC A17/MF A03 CSCL 09B  
ARTIFICIAL INTELLIGENCE, COMPUTER VISION, COMPUTERIZED SIMULATION, CONFERENCES, DATA MANAGEMENT, EXPERT SYSTEMS, FAILURE ANALYSIS, IMAGE PROCESSING, MISSION PLANNING

**N90-10618\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**OPTIMIZED RESOLVED RATE CONTROL OF SEVEN-DEGREE-OF-FREEDOM LABORATORY TELEROBOTIC MANIPULATOR (LTM) WITH APPLICATION TO THREE-DIMENSIONAL GRAPHICS SIMULATION**  
L. KEITH BARKER and WILLIAM S. MCKINNEY, JR. Washington Oct. 1989 80 p (NASA-TP-2938; L-16562; NAS 1.60:2938) Avail: NTIS HC A05/MF A01 CSCL 09B  
DEGREES OF FREEDOM, MANIPULATORS, OPTIMAL CONTROL, REAL TIME OPERATION, ROBOT CONTROL, ROBOTICS, TELEROBOTICS

**N90-22294\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**THE 1990 GODDARD CONFERENCE ON SPACE APPLICATIONS OF ARTIFICIAL INTELLIGENCE**  
JAMES L. RASH, ed. May 1990 342 p Conference held in Greenbelt, MD, 1-2 May 1990 (NASA-CP-3068; REPT-90B00078; NAS 1.55:3068) Avail: NTIS HC A15/MF A02 CSCL 09B  
ARCHITECTURE (COMPUTERS), ARTIFICIAL INTELLIGENCE, CONFERENCES, FAULT TOLERANCE, PLANNING, SCHEDULING

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### NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

**N87-14054\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**SOME PATH-FOLLOWING TECHNIQUES FOR SOLUTION OF NONLINEAR EQUATIONS AND COMPARISON WITH PARAMETRIC DIFFERENTIATION**  
R. L. BARGER and R. W. WALTERS (Virginia Polytechnic Inst. and State Univ., Blacksburg.) 1986 16 p (NASA-TP-2654; L-16199; NAS 1.60:2654) Avail: NTIS HC A03/MF A01 CSCL 12A  
COMPUTER PROGRAMMING, CRITICAL PATH METHOD, DIFFERENTIAL EQUATIONS, NONLINEAR EQUATIONS, PARAMETER IDENTIFICATION

**N87-14918\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**SOLUTION OF ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS BY FAST POISSON SOLVERS USING A LOCAL RELAXATION FACTOR. 2: TWO-STEP METHOD**  
S. C. CHANG May 1986 17 p (NASA-TP-2530; E-2528-1; NAS 1.60:2530) Avail: NTIS HC A03/MF A01 CSCL 12A  
ELLIPTIC DIFFERENTIAL EQUATIONS, ELLIPTIC FUNCTIONS, PARTIAL DIFFERENTIAL EQUATIONS, PROBLEM SOLVING

**N87-22441\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**QUANTITATIVE ANALYSIS OF THE RECONSTRUCTION PERFORMANCE OF INTERPOLANTS**  
 DONALD L. LANSING and STEPHEN K. PARK (College of William and Mary, Williamsburg, Va.) May 1987 35 p  
 (NASA-TP-2688; L-16164; NAS 1.60:2688) Avail: NTIS HC A03/MF A01 CSCL 12A  
 INTERPOLATION, QUANTITATIVE ANALYSIS, RECONSTRUCTION

**N87-22447\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**AN ALGORITHM FOR SURFACE SMOOTHING WITH RATIONAL SPLINES**  
 JAMES R. SCHIESS Jun. 1987 17 p  
 (NASA-TP-2708; L-16272; NAS 1.60:2708) Avail: NTIS HC A03/MF A01 CSCL 12A  
 ALGORITHMS, RATIONAL FUNCTIONS, SMOOTHING, SPLINE FUNCTIONS, SURFACE ROUGHNESS

**N87-28367\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EXPERIMENTS IN ENCODING MULTILEVEL IMAGES AS QUADTREES**  
 DONALD L. LANSING Sep. 1987 60 p  
 (NASA-TP-2722; L-16292; NAS 1.60:2722) Avail: NTIS HC A04/MF A01 CSCL 12A  
 CODING, DATA COMPRESSION, DATA STORAGE, GRAY SCALE, IMAGE PROCESSING

**N89-12316\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**THREE-DIMENSIONAL MULTIGRID ALGORITHMS FOR THE FLUX-SPLIT EULER EQUATIONS**  
 W. KYLE ANDERSON, JAMES L. THOMAS, and DAVID L. WHITFIELD (Mississippi State Univ., Mississippi State.) Nov. 1988 41 p  
 (NASA-TP-2829; L-16416; NAS 1.60:2829) Avail: NTIS HC A03/MF A01 CSCL 12A  
 APPROXIMATION, COMPUTATIONAL FLUID DYNAMICS, EULER EQUATIONS OF MOTION, FLUX VECTOR SPLITTING, THREE DIMENSIONAL FLOW

**N89-16415\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EFFECT OF EPHEMERIS ERRORS ON THE ACCURACY OF THE COMPUTATION OF THE TANGENT POINT ALTITUDE OF A SOLAR SCANNING RAY AS MEASURED BY THE SAGE 1 AND 2 INSTRUMENTS**  
 JAMES J. BUGLIA Washington, DC Feb. 1989 29 p  
 (NASA-TP-2866; L-16485; NAS 1.60:2866) Avail: NTIS HC A03/MF A01 CSCL 12A  
 ALTITUDE, APPROXIMATION, EPHEMERIDES, POSITION ERRORS, SAGE SATELLITE, SCANNING, SPACECRAFT ORBITS, SUN, TANGENTS

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## STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

**N87-23244\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**DEVELOPMENT OF CONFIDENCE LIMITS BY PIVOTAL FUNCTIONS FOR ESTIMATING SOFTWARE RELIABILITY**  
 KELLY J. DOTSON Jun. 1987 12 p

(NASA-TP-2709; L-16264; NAS 1.60:2709) Avail: NTIS HC A03/MF A01 CSCL 12A  
 CONFIDENCE LIMITS, FAILURE ANALYSIS, PREDICTIONS, RELIABILITY ANALYSIS, SOFTWARE ENGINEERING

**N87-27474\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.  
**PROBABILISTIC RISK ANALYSIS OF FLYING THE SPACE SHUTTLE WITH AND WITHOUT FUEL TURBINE DISCHARGE TEMPERATURE REDLINE PROTECTION**  
 LEONARD HOWELL Aug. 1987 22 p  
 (NASA-TP-2759; NAS 1.60:2759) Avail: NTIS HC A03/MF A01 CSCL 12A  
 ENGINE FAILURE, MATHEMATICAL MODELS, SPACE SHUTTLE MAIN ENGINE, SPACECRAFT RELIABILITY, STOCHASTIC PROCESSES, TEMPERATURE SENSORS

**N88-17380\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**SURE RELIABILITY ANALYSIS: PROGRAM AND MATHEMATICS**  
 RICKY W. BUTLER and ALLAN L. WHITE Mar. 1988 77 p  
 (NASA-TP-2764; L-16263; NAS 1.60:2764) Avail: NTIS HC A05/MF A01 CSCL 12A  
 APPLICATIONS PROGRAMS (COMPUTERS), FAULT TOLERANCE, MARKOV PROCESSES, MATHEMATICAL MODELS, RELIABILITY ANALYSIS

**N88-22653\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**ANALYSIS AND TESTING OF THE SURE PROGRAM**  
 KELLY J. DOTSON 1988 1 p  
 (NASA-TP-2817; L-16413; NAS 1.60:2817) PREVIEW CSCL 12A  
 COMPUTER PROGRAMS, ERROR ANALYSIS, FAULT TOLERANCE, MARKOV PROCESSES, MATHEMATICAL MODELS, RELIABILITY ANALYSIS

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## SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

**N88-21740\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.  
**USER'S MANUAL FOR LINEAR, A FORTRAN PROGRAM TO DERIVE LINEAR AIRCRAFT MODELS**  
 EUGENE L. DUKE, BRIAN P. PATTERSON, and ROBERT F. ANTONIEWICZ Dec. 1987 109 p  
 (NASA-TP-2768; H-1259; NAS 1.60:2768) Avail: NTIS HC A06/MF A01 CSCL 12B  
 AIRCRAFT MODELS, COMPUTER PROGRAMS, FORTRAN, LINEARIZATION

**N89-16437\*#** National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.  
**USER'S MANUAL FOR INTERACTIVE LINEAR: A FORTRAN PROGRAM TO DERIVE LINEAR AIRCRAFT MODELS**  
 ROBERT F. ANTONIEWICZ, EUGENE L. DUKE, and BRIAN P. PATTERSON Sep. 1988 126 p  
 (NASA-TP-2835; H-1443; NAS 1.60:2835) Avail: NTIS HC A07/MF A01 CSCL 12B  
 AIRCRAFT DESIGN, FORTRAN, INTERACTIVE CONTROL, LINEAR SYSTEMS, USER MANUALS (COMPUTER PROGRAMS)

## 67 THEORETICAL MATHEMATICS

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### THEORETICAL MATHEMATICS

Includes topology and number theory.

**N89-14052\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**AN ECONOMICAL SEMI-ANALYTICAL ORBIT THEORY FOR MICRO-COMPUTER APPLICATIONS**  
R. A. GORDON Washington, D.C. Mar. 1988 46 p  
(NASA-TP-2811; REPT-86B0451; NAS 1.60:2811) Avail: NTIS HC A03/MF A01 CSCL 12A  
AERODYNAMIC DRAG, COMPUTER TECHNIQUES, ORBIT CALCULATION, ORBIT PERTURBATION, ZONAL HARMONICS

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### PHYSICS (GENERAL)

**N89-14053\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**A GENERAL FORMALISM FOR PHASE SPACE CALCULATIONS**  
JOHN W. NORBURY, PHILIP A. DEUTCHMAN, LAWRENCE W. TOWNSEND, and FRANCIS A. CUCINOTTA (Old Dominion Univ., Norfolk, Va.) Nov. 1988 23 p  
(NSF PHY-84-11009)  
(NASA-TP-2843; L-16463; NAS 1.60:2843) Avail: NTIS HC A03/MF A01 CSCL 20C  
GALACTIC COSMIC RAYS, NORMALITY, PHASE-SPACE INTEGRAL

**N90-12282\*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.  
**PARAMETRIC STUDY OF POWER ABSORPTION FROM ELECTROMAGNETIC WAVES BY SMALL FERRITE SPHERES**  
GERALD W. ENGLERT Nov. 1989 22 p  
(NASA-TP-2949; E-4601; NAS 1.60:2949) Avail: NTIS HC A03/MF A01 CSCL 20C  
EDDY CURRENTS, ELECTROMAGNETIC RADIATION, FERRITES, HYSTERESIS, RADIATION ABSORPTION, SPHERES

**N90-18957\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.  
**ANNIHILATION IN GASES AND GALAXIES**  
RICHARD J. DRACHMAN, ed. Washington Jan. 1990 271 p  
Workshop held in Greenbelt, MD, 19-21 Jul. 1989  
(NASA-CP-3058; REPT-90B00019; NAS 1.55:3058) Avail: NTIS HC A12/MF A02 CSCL 20H  
ANNIHILATION REACTIONS, ANTIMATTER, POSITRONIUM, POSITRONS, SCATTERING CROSS SECTIONS

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### ACOUSTICS

Includes sound generation, transmission, and attenuation.

**N87-14120\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EFFECTS OF BACKGROUND NOISE ON TOTAL NOISE ANNOYANCE**

K. F. WILLSHIRE Jan. 1987 59 p  
(NASA-TP-2630; L-16153; NAS 1.60:2630) Avail: NTIS HC A04/MF A01 CSCL 46A  
BACKGROUND NOISE, EFFECTIVE PERCEIVED NOISE LEVELS, NOISE INTENSITY, NOISE POLLUTION, NOISE TOLERANCE

**N87-17479\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**POWER CEPSTRUM TECHNIQUE WITH APPLICATION TO MODEL HELICOPTER ACOUSTIC DATA**  
R. M. MARTIN and C. L. BURLEY Washington Jun. 1986 68 p  
(NASA-TP-2586; L-16070; NAS 1.60:2586) Avail: NTIS HC A04/MF A01 CSCL 20A  
ACOUSTIC MEASUREMENT, CEPSTRAL ANALYSIS, HELICOPTERS, MODELS, SIGNAL REFLECTION

**N87-18399\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**CORRELATION OF HELICOPTER IMPULSIVE NOISE FROM BLADE-VORTEX INTERACTION WITH ROTOR MEAN INFLOW**  
ANDREW B. CONNOR and R. M. MARTIN Mar. 1987 23 p  
(NASA-TP-2650; L-16145; NAS 1.60:2650) Avail: NTIS HC A03/MF A01 CSCL 20A  
BLADE SLAP NOISE, BLADE-VORTEX INTERACTION, ROTOR BLADES (TURBOMACHINERY), VORTICES, WIND TUNNEL TESTS

**N87-20798\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EXPERIMENTAL VALIDATION OF A TWO-DIMENSIONAL SHEAR-FLOW MODEL FOR DETERMINING ACOUSTIC IMPEDANCE**  
TONY L. PARROTT, WILLIE R. WATSON, and MICHAEL G. JONES (PRC Kentron, Inc., Hampton, Va.) May 1987 50 p  
(NASA-TP-2679; L-16203; NAS 1.60:2679) Avail: NTIS HC A03/MF A01 CSCL 20A  
ACOUSTIC IMPEDANCE, MODELS, SHEAR FLOW, TWO DIMENSIONAL FLOW, TWO DIMENSIONAL MODELS

**N87-24161\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**ANNOYANCE RESPONSE TO SIMULATED ADVANCED TURBOPROP AIRCRAFT INTERIOR NOISE CONTAINING TONAL BEATS**  
JACK D. LEATHERWOOD Jul. 1987 28 p  
(NASA-TP-2689; L-16184; NAS 1.60:2689) Avail: NTIS HC A03/MF A01 CSCL 20A  
AIRCRAFT COMPARTMENTS, AIRCRAFT NOISE, HUMAN TOLERANCES, PSYCHOLOGICAL EFFECTS, RESPONSES

**N88-11450\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**EVALUATION OF A SCALE-MODEL EXPERIMENT TO INVESTIGATE LONG-RANGE ACOUSTIC PROPAGATION**  
TONY L. PARROTT, GERRY L. MCANINCH, and INGRID A. CARLBERG Nov. 1987 55 p  
(NASA-TP-2748; L-16300; NAS 1.60:2748) Avail: NTIS HC A04/MF A01 CSCL 20A  
ACOUSTICS, FEASIBILITY ANALYSIS, MATHEMATICAL MODELS, SCALE MODELS, TERRAIN, WAVE PROPAGATION

**N88-13002\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**MEASUREMENT OF VELOCITY AND VORTICITY FIELDS IN THE WAKE OF AN AIRFOIL IN PERIODIC PITCHING MOTION**  
EARL R. BOOTH, JR. Dec. 1987 31 p  
(NASA-TP-2780; L-16339; NAS 1.60:2780) Avail: NTIS HC A03/MF A01 CSCL 20A  
AIRFOILS, PITCH (INCLINATION), VORTICES, VORTICITY, WAKES



**N88-16510\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.  
**SHOCK STRUCTURE AND NOISE OF SUPERSONIC JETS IN SIMULATED FLIGHT TO MACH 0.4**

THOMAS D. NORUM and JOHN G. SHEARIN Feb. 1988 187 p  
 (NASA-TP-2785; L-16341; NAS 1.60:2785) Avail: NTIS HC A09/MF A01 CSCL 20A

JET AIRCRAFT NOISE, MACH NUMBER, SHOCK WAVES, SUPERSONIC AIRCRAFT

**N88-17440\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**MEASURED AND CALCULATED ACOUSTIC ATTENUATION RATES OF TUNED RESONATOR ARRAYS FOR TWO SURFACE IMPEDANCE DISTRIBUTION MODELS WITH FLOW**  
 TONY L. PARROTT, A. LOUIS ABRAHAMSON, and MICHAEL G. JONES (PRC Kentron, Inc., Hampton, Va.) Jan. 1988 51 p  
 (NASA-TP-2766; L-16352; NAS 1.60:2766) Avail: NTIS HC A04/MF A01 CSCL 20A

ACOUSTIC ATTENUATION, ACOUSTIC IMPEDANCE, CAVITY RESONATORS, ENGINE NOISE, FINITE ELEMENT METHOD, GRAZING FLOW, NOISE REDUCTION

**N88-17441\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ANNOYANCE CAUSED BY ADVANCED TURBOPROP AIRCRAFT FLYOVER NOISE: SINGLE-ROTATING PROPELLER CONFIGURATION**

DAVID A. MCCURDY Mar. 1988 43 p  
 (NASA-TP-2782; L-16301; NAS 1.60:2782) Avail: NTIS HC A03/MF A01 CSCL 20A

ENGINE NOISE, JET AIRCRAFT NOISE, NOISE INTENSITY, NOISE TOLERANCE, PROPELLER FANS, TOLERANCES (PHYSIOLOGY)

**N88-22710\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ADVANCING-SIDE DIRECTIVITY AND RETREATING-SIDE INTERACTIONS OF MODEL ROTOR BLADE-VORTEX INTERACTION NOISE**

R. M. MARTIN, W. R. SPLETTSTOESSER, J. W. ELLIOTT, and K.-J. SCHULTZ (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick, West Germany) May 1988 43 p

(NASA-TP-2784; L-16354; NAS 1.60:2784; AVSCOM-TR-87-B-3) Avail: NTIS HC A03/MF A01 CSCL 20A

BLADE-VORTEX INTERACTION, ROTOR AERODYNAMICS

**N88-26907\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**HELICOPTER MAIN-ROTOR NOISE: DETERMINATION OF SOURCE CONTRIBUTIONS USING SCALED MODEL DATA**

THOMAS F. BROOKS, J. RALPH JOLLY, JR. (Planning Research Corp., Hampton, Va.), and MICHAEL A. MARCOLINI Aug. 1988 66 p

(NASA-TP-2825; L-16399; NAS 1.60:2825) Avail: NTIS HC A04/MF A01 CSCL 20A

AIRCRAFT NOISE, BLADE SLAP NOISE, BO-105 HELICOPTER, ROTARY WINGS, WIND TUNNEL TESTS

**N89-25673\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**AIRFOIL SELF-NOISE AND PREDICTION**

THOMAS F. BROOKS, D. STUART POPE (PRC Kentron, Inc., Hampton, Va.), and MICHAEL A. MARCOLINI Jul. 1989 145 p  
 (NASA-RP-1218; L-16528; NAS 1.61:1218) Avail: NTIS HC A07/MF A01 CSCL 20A

A prediction method is developed for the self-generated noise of an airfoil blade encountering smooth flow. The prediction methods for the individual self-noise mechanisms are semiempirical and are based on previous theoretical studies and data obtained from tests of two- and three-dimensional airfoil blade sections.

The self-noise mechanisms are due to specific boundary-layer phenomena, that is, the boundary-layer turbulence passing the trailing edge, separated-boundary-layer and stalled flow over an airfoil, vortex shedding due to laminar boundary layer instabilities, vortex shedding from blunt trailing edges, and the turbulent vortex flow existing near the tip of lifting blades. The predictions are compared successfully with published data from three self-noise studies of different airfoil shapes. An application of the prediction method is reported for a large scale-model helicopter rotor, and the predictions compared well with experimental broadband noise measurements. A computer code of the method is given. Author

**N90-10680\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**FLUCTUATING PRESSURES MEASURED BENEATH A HIGH-TEMPERATURE, TURBULENT BOUNDARY LAYER ON A FLAT PLATE AT MACH NUMBER OF 5**

TONY L. PARROTT, MICHAEL G. JONES (Planning Research Corp., Hampton, Va.), and CINDY W. ALBERTSON Washington Nov. 1989 39 p

(NASA-TP-2947; L-16596; NAS 1.60:2947) Avail: NTIS HC A03/MF A01 CSCL 20A

HIGH TEMPERATURE, MACH NUMBER, PIEZORESISTIVE TRANSDUCERS, PRESSURE MEASUREMENT, SIGNAL PROCESSING, TURBULENT BOUNDARY LAYER

**N90-24853\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**FAA/NASA EN ROUTE NOISE SYMPOSIUM**

CLEMANS A. POWELL, comp. Washington Apr. 1990 301 p  
 Symposium held in Hampton, VA, 12-13 Sep. 1989

(NASA-CP-3067; L-16763; NAS 1.55:3067) Avail: NTIS HC A14/MF A02 CSCL 20A

AIRCRAFT NOISE, AIRPORTS, CONFERENCES, NASA PROGRAMS, NOISE POLLUTION, NOISE TOLERANCE, PROPELLERS, ROUTES

**N90-29166\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ANNOYANCE CAUSED BY ADVANCED TURBOPROP AIRCRAFT FLYOVER NOISE:**

**COUNTER-ROTATING-PROPELLER CONFIGURATION**

DAVID A. MCCURDY Washington Sep. 1990 88 p  
 (NASA-TP-3027; L-16780; NAS 1.60:3027) Avail: NTIS HC A05/MF A01 CSCI 20A

HUMAN TOLERANCES, NOISE INTENSITY, NOISE TOLERANCE, PROPELLER NOISE, PSYCHOACOUSTICS, SOUND PRESSURE

## ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.

**N89-30022\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**AUGER ELECTRON INTENSITY VARIATIONS IN OXYGEN-EXPOSED LARGE GRAIN POLYCRYSTALLINE SILVER**

W. S. LEE, R. A. OUTLAW, G. B. HOFLUND, and M. R. DAVIDSON (Florida Univ., Gainesville.) 1989 18 p

(NASA-TP-2930; L-16579; NAS 1.60:2930) Avail: NTIS HC A03/MF A01 CSCL 20H

AUGER SPECTROSCOPY, CRYSTALLOGRAPHY, ELECTRON FLUX DENSITY, OXYGEN RECOMBINATION, POLYCRYSTALS, SILVER

## 73 NUCLEAR AND HIGH-ENERGY PHYSICS

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### NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

**N87-17487\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

#### DOUBLY DIFFERENTIAL CROSS SECTIONS FOR GALACTIC HEAVY-ION FRAGMENTATION

FRANCIS A. CUCINOTTA (Old Dominion Univ., Norfolk, Va.), JOHN W. NORBURY, GOVIND S. KHANDELWAL, and LAWRENCE W. TOWNSEND Feb. 1987 23 p  
(NASA-TP-2659; L-16187; NAS 1.60:2659) Avail: NTIS HC A03/MF A01 CSCL 20H

COLLISION PARAMETERS, GALAXIES, HEAVY IONS, PARTICLE COLLISIONS, SCATTERING CROSS SECTIONS

**N87-24977\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

#### POSSIBLE COMPLEMENTARY COSMIC-RAY SYSTEMS: NUCLEI AND ANTINUCLEI

WARREN W. BUCK, JOHN W. WILSON, LAWRENCE W. TOWNSEND, and JOHN W. NORBURY (Idaho Univ., Moscow.) Jul. 1987 47 p

(NASA-TP-2741; L-16275; NAS 1.60:2741) Avail: NTIS HC A03/MF A01 CSCL 20H

ANTIMATTER, ANTIPARTICLES, GALACTIC COSMIC RAYS, HEAVY IONS, NUCLEI (NUCLEAR PHYSICS)

**N88-13015\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

#### NUCLEAR TECHNIQUES IN STUDIES OF CONDENSED MATTER

JAG J. SINGH Aug. 1987 22 p  
(NASA-RP-1195; L-16361; NAS 1.61:1195) Avail: NTIS HC A03/MF A01 CSCL 20H

Nuclear techniques have played an important role in the studies of materials over the past several decades. For example, X-ray diffraction, neutron diffraction, neutron activation, and particle- or photon-induced X-ray emission techniques have been used extensively for the elucidation of structural and compositional details of materials. Several new techniques have been developed recently. Four such techniques are briefly reviewed which have great potential in the study and development of new materials. Of these four, Mossbauer spectroscopy, muon spin rotation, and positron annihilation spectroscopy techniques exploit their great sensitivity to the local atomic environments in the test materials. Interest in synchrotron radiation, on the other hand, stems from its special properties, such as high intensity, high degree of polarization, and high monochromaticity. It is hoped that this brief review will stimulate interest in the exploitation of these newer techniques for the development of improved materials. Author

**N88-30402\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

#### EIKONAL SOLUTIONS TO OPTICAL MODEL COUPLED-CHANNEL EQUATIONS

FRANCIS A. CUCINOTTA, GOVIND S. KHANDELWAL, KHIN M. MAUNG (Old Dominion Univ., Norfolk, Va.), LAWRENCE W. TOWNSEND, and JOHN W. WILSON Nov. 1988 30 p  
(NASA-TP-2830; L-16462; NAS 1.60:2830) Avail: NTIS HC A03/MF A01 CSCL 20H

EIKONAL EQUATION, ELASTIC SCATTERING, HEAVY IONS, INELASTIC SCATTERING, IONIC COLLISIONS, NUCLEAR SCATTERING, SCATTERING AMPLITUDE

**N90-14890\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

#### CALCULATION OF TWO-NEUTRON MULTIPLICITY IN PHOTONUCLEAR REACTIONS

JOHN W. NORBURY (Rider Coll., Lawrenceville, NJ.) and

LAWRENCE W. TOWNSEND Jan. 1990 11 p  
(NASA-TP-2968; L-16610; NAS 1.60:2968) Avail: NTIS HC A03/MF A01 CSCL 20H

EJECTION, EXCITATION, PARTICLE COLLISIONS, PARTICLE EMISSION, PHOTONUCLEAR REACTIONS

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### OPTICS

Includes light phenomena; and optical devices.

**N87-13264\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

#### THEORY FOR COMPUTING THE FIELD SCATTERED FROM A SMOOTH INFLECTED SURFACE

R. L. BARGER and A. K. DOMINEK 1986 23 p  
(NASA-TP-2632; L-16157; NAS 1.60:2632) Avail: NTIS HC A03/MF A01 CSCL 20F

BODIES OF REVOLUTION, ELECTROMAGNETIC RADIATION, MICROWAVES, REFLECTANCE, SURFACE PROPERTIES, WAVE SCATTERING

**N90-25673\*#** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, AL.

#### MODE-MEDIUM INSTABILITY AND ITS CORRECTION WITH A GAUSSIAN REFLECTIVITY MIRROR

K. L. WEBSTER and C. C. SUNG (Alabama Univ., Huntsville.) Washington Jun. 1990 26 p  
(NASA-TP-3023; NAS 1.60:3023) Avail: NTIS HC A03/MF A01 CSCL 20F

CARBON DIOXIDE LASERS, HIGH POWER LASERS, LASER BEAMS, LASER STABILITY, LASING, MIRRORS, REFLECTANCE

75

### PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

**N87-10764\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

#### LASER-POWERED MHD GENERATORS FOR SPACE APPLICATION

N. W. JALUFKA Oct. 1986 15 p  
(NASA-TP-2621; NAS 1.60:2621) Avail: NTIS HC A03/MF A01 CSCL 20I

ENERGY CONVERSION EFFICIENCY, LASER PLASMA INTERACTIONS, MAGNETOHYDRODYNAMIC GENERATORS

**N87-14998\*#** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, OH.

#### ASYMPTOTIC ANALYSIS OF CORONA DISCHARGE FROM THIN ELECTRODES

P. A. DURBIN Sep. 1986 7 p  
(NASA-TP-2645; E-3151; NAS 1.60:2645) Avail: NTIS HC A02/MF A01 CSCL 20I

ASYMPTOTIC METHODS, ELECTRIC CORONA, ELECTRIC DISCHARGES, ELECTRODES

**N88-18443\*#** National Aeronautics and Space Administration.  
Langley Research Center, Hampton, VA.

#### LASER PRODUCTION AND HEATING OF PLASMA FOR MHD APPLICATION

N. W. JALUFKA Mar. 1988 11 p

(NASA-TP-2798; L-16373; NAS 1.60:2798) Avail: NTIS HC A03/MF A01 CSCL 20L

ELECTRIC GENERATORS, ENERGY CONVERSION EFFICIENCY, MAGNETOHYDRODYNAMIC GENERATORS, PLASMA HEATING

**N89-14842\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**LUNAR HELIUM-3 AND FUSION POWER**

Washington, DC Sep. 1988 234 p Workshop held in Cleveland, Ohio, 25-26 Apr. 1988

(NASA-CP-10018; E-4254; NAS 1.55:10018) Avail: NTIS HC A11/MF A02 CSCL 20L

HELIUM ISOTOPES, LUNAR SOIL, MINING, NUCLEAR FUSION, REGOLITH

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## SOLID-STATE PHYSICS

Includes superconductivity.

**N90-12348\*#** National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

**FORTRAN PROGRAM FOR X RAY PHOTOELECTRON SPECTROSCOPY DATA REFORMATTING**

PHILLIP B. ABEL Nov. 1989 10 p

(NASA-TP-2957; E-4867; NAS 1.60:2957) Avail: NTIS HC A02/MF A01 CSCL 20L

BINARY DATA, COMPUTER PROGRAMS, ELECTRON SPECTROSCOPY, FORMAT, FORTRAN, X RAY SPECTROSCOPY

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## ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

**N87-20833\*** National Aeronautics and Space Administration, Washington, DC.

**MANAGEMENT: A BIBLIOGRAPHY FOR NASA MANAGERS (SUPPLEMENT 21)**

Apr. 1987 70 p

(NASA-SP-7500(21); NAS 1.21:7500(21)) Avail: NTIS HC A04 CSCL 05A

This bibliography lists 664 reports, articles and other documents introduced into the NASA scientific and technical information system in 1986. Items are selected and grouped according to their usefulness to the manager as manager. Citations are grouped into ten subject categories: human factors and personnel issues; management theory and techniques; industrial management and manufacturing; robotics and expert systems; computers and information management; research and development; economics, costs, and markets; logistics and operations management; reliability and quality control; and legality, legislation, and policy Author

**N88-21867\*** National Aeronautics and Space Administration, Washington, DC.

**MANAGEMENT: A BIBLIOGRAPHY FOR NASA MANAGERS**

Apr. 1988 158 p

(NASA-SP-7500(22); NAS 1.21:7500(22)) Avail: NTIS HC A08 CSCL 05A

This bibliography lists 653 reports, articles and other documents introduced into the NASA scientific and technical information system in 1987. Items are selected and grouped according to their usefulness to the manager as manager. Citations are grouped

into ten subject categories; human factors and personnel issues; management theory and techniques; industrial management and manufacturing; robotics and expert systems; computers and information management; research and development; economics, costs and markets; logistics and operations management, reliability and quality control; and legality, legislation, and policy. Author

**N89-12479\*#** National Aeronautics and Space Administration, Washington, DC.

**ISSUES IN NASA PROGRAM AND PROJECT MANAGEMENT**

FRANCIS T. HOBAN, ed. Oct. 1988 51 p

(NASA-SP-6101; NAS 1.21:6101) Avail: NTIS HC A04/MF A01 CSCL 05A

This collection of papers and resources on aerospace management issues is inspired by a desire to benefit from the lessons learned from past projects and programs. Inherent in the NASA culture is a respect for divergent viewpoints and innovative ways of doing things. This publication presents a wide variety of views and opinions. Good management is enhanced when program and project managers examine the methods of veteran managers, considering the lessons they have learned and reflected on their own guiding principles. Author

**N89-26766\*** National Aeronautics and Space Administration, Washington, DC.

**MANAGEMENT: A BIBLIOGRAPHY FOR NASA MANAGERS**

Apr. 1989 198 p

(NASA-SP-7500(23); NAS 1.21:7500(23)) Avail: NTIS HC A09 CSCL 05A

This bibliography lists 822 reports, articles and other documents introduced into the NASA Scientific and Technical Information System in 1988. Items are selected and grouped according to their usefulness to the manager as manager. Citations are grouped into ten subject categories: human factors and personnel issues; management theory and techniques; industrial management and manufacturing; robotics and expert systems; computers and information management; research and development; economics, costs and markets; logistics and operations management; reliability and quality control; and legality, legislation, and policy. Author

**N90-12385\*#** National Aeronautics and Space Administration, Washington, DC.

**WORKING WITH PEOPLE TO IMPROVE PRODUCTIVITY AND QUALITY: A BIBLIOGRAPHY WITH INDEXES, 1934-1988**

Oct. 1989 72 p

(NASA-SP-7078; NAS 1.21:7078) Avail: NTIS HC A04 CSCL 05A

This bibliography contains 253 annotated references to reports and journal articles entered into the NASA scientific and technical information database 1984 to 1988. Author

**N90-13277\*#** National Aeronautics and Space Administration, Washington, DC.

**ISSUES IN NASA PROGRAM AND PROJECT MANAGEMENT**

FRANCIS T. HOBAN, ed. 1989 57 p

(NASA-SP-6101(02); NAS 1.21:6101(02)) Avail: NTIS HC A04/MF A01; SOD HC \$15.00 as 033-000-010-64-8 CSCL 05A

This new collection of papers on aerospace management issues contains a history of NASA program and project management, some lessons learned in the areas of management and budget from the Space Shuttle Program, an analysis of tools needed to keep large multilayer programs organized and on track, and an update of resources for NASA managers. A wide variety of opinions and techniques are presented. Author

**N90-24174\*** National Aeronautics and Space Administration, Washington, DC.

**MANAGEMENT: A BIBLIOGRAPHY FOR NASA MANAGERS**

Mar. 1990 190 p

(NASA-SP 7500(24); NAS 1.21:7500(24)) Avail: NTIS HC A09 CSCL 05A

This bibliography lists 755 reports, articles and other documents introduced into the NASA Scientific and Technical Information

## 82 DOCUMENTATION AND INFORMATION SCIENCE

System in 1989. Items are selected and grouped according to their usefulness to the manager as manager. Citations are grouped into ten subject categories: human factors and personnel issues; management theory and techniques; industrial management and manufacturing; robotics and expert systems; computers and information management; research and development; economics, costs and markets; logistics and operations management; reliability and quality control; and legality, legislation, and policy. Author

## 82

### DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.

**N87-25023\*** National Aeronautics and Space Administration, Washington, DC.

**NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 31)**  
Jul. 1987 45 p

(NASA-SP-7039(31)-SECT-1; NAS 1.21:7039(31)-SECT-1) Avail: NTIS HC A03; NTIS standing order as PB86-911100, \$11.50 domestic, \$23.00 foreign CSCL 05B

Abstracts are provided for 85 patents and patent applications entered into the NASA scientific and technical information system during the period January 1987 through June 1987. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. Author

**N87-26689\*** National Aeronautics and Space Administration, Washington, DC.

**NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES (SUPPLEMENT 31)**  
Jul. 1987 493 p

(NASA-SP-7039(31)-SECT-2; NAS 1.21:7039(31)-SECT-2) Avail: NTIS HC A21 CSCL 05B

A subject index is provided for over 4600 patents and patent applications for the period May 1969 through June 1987. Additional indexes list personal authors, corporate authors, contract numbers, NASA case numbers, U.S. patent class numbers, and NASA accession numbers. Author

**N87-27557\*** National Aeronautics and Space Administration, Washington, DC.

**NASA THESAURUS SUPPLEMENT: A FOUR PART CUMULATIVE SUPPLEMENT TO THE 1985 EDITION OF THE NASA THESAURUS (SUPPLEMENT 3)**

Jul. 1987 325 p  
(NASA-SP-7053-SUPPL-3; NAS 1.21:7053-SUPPL-3) Avail: NTIS HC A14 CSCL 05B

The four part cumulative NASA Thesaurus Supplement to the 1985 edition of the NASA Thesaurus includes Part 1, Hierarchical Listing, Part 2, Access Vocabulary, Part 3, NASA Thesaurus Definitions, and Part 4, Changes. The semiannual supplement gives complete hierarchies for new terms. Author

**N87-30218\*#** National Aeronautics and Space Administration, Washington, DC.

**NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS: A CATALOG OF SPECIAL PUBLICATIONS, REFERENCE PUBLICATIONS, CONFERENCE PUBLICATIONS, AND TECHNICAL PAPERS, 1977-1986**

Sep. 1987 390 p  
(NASA-SP-7063(01); NAS 1.21:7063(01)) Avail: NTIS HC free as PR-655B; NASA Scientific and Technical Information Facility, P.O. Box 8757, BWI Airport, Md. 21240 HC free CSCL 05B

This catalog lists 2311 citations of all NASA Special Publications, NASA Reference Publications, NASA Conference Publications, and NASA Technical Papers that were entered into the NASA scientific

and technical database during the decade 1977 through 1986. The entries are grouped by subject category. Indexes of subject terms, personal authors, and NASA report numbers are provided.

Author

**N88-15732\*** National Aeronautics and Space Administration, Washington, DC.

**NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 32)**  
Jan. 1988 61 p

(NASA-SP-7039(32)-SECT-1; NAS 1.21:7039(32)-SECT-1) Avail: NTIS HC A04; NTIS standing order as PB 88-911100, \$12.50 domestic, \$25.00 foreign CSCL 05B

Abstracts are provided for 136 patents and patent applications entered into the NASA scientific and technical information system during the period July through December 1987. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. Author

**N88-18511\*** National Aeronautics and Space Administration, Washington, DC.

**NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES (SUPPLEMENT 32)**  
Jan. 1988 499 p

(NASA-SP-7039(32)-SECT-2; NAS 1.21:7039(32)-SECT-2) Avail: NTIS HC A21; NTIS standing order as PB88-911100, \$26.50 domestic, \$53.00 foreign CSCL 05B

A subject index is provided for over 4700 patents and patent applications for the period May 1969 through December 1987. Additional indexes list personal authors, corporate authors, contract numbers, NASA case numbers, U.S. patent class numbers, U.S. patent numbers, and NASA accession numbers. Author

**N88-22830\*#** National Aeronautics and Space Administration, Washington, DC.

**NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS: A CATALOG OF SPECIAL PUBLICATIONS, REFERENCE PUBLICATIONS, CONFERENCE PUBLICATIONS, AND TECHNICAL PAPERS, 1987**

Mar. 1988 69 p  
(NASA-SP-7063(02); NAS 1.21:7063(02)) Avail: NTIS HC free as PR-828; NASA Scientific and Technical Information Facility, P.O. Box 8757, BWI Airport, Md. 21240 HC free CSCL 05B

This catalog lists 239 citations of all NASA Special Publications, NASA Reference Publications, NASA Conference Publications, and NASA Technical Papers that were entered in the NASA scientific and technical information database during accession year 1987. The entries are grouped by subject category. Indexes of subject terms, personal authors, and NASA report numbers are provided.

Author

**N89-13301\*#** National Aeronautics and Space Administration, Washington, DC.

**NASA THESAURUS. VOLUME 3: DEFINITIONS**  
Jul. 1988 148 p

(NASA-SP-7064-VOL-3; NAS 1.21:7064-VOL-3) Avail: NTIS HC A07 CSCL 05B

Publication of NASA Thesaurus definitions began with Supplement 1 to the 1985 NASA Thesaurus. The definitions given here represent the complete file of over 3,200 definitions, complimented by nearly 1,000 use references. Definitions of more common or general scientific terms are given a NASA slant if one exists. Certain terms are not defined as a matter of policy: common names, chemical elements, specific models of computers, and nontechnical terms. The NASA Thesaurus predates by a number of years the systematic effort to define terms, therefore not all Thesaurus terms have been defined. Nevertheless, definitions of older terms are continually being added. The following data are provided for each entry: term in uppercase/lowercase form, definition, source, and year the term (not the definition) was added to the NASA Thesaurus. The NASA History Office is the authority for capitalization in satellite and spacecraft names. Definitions with no source given were constructed by lexicographers at the NASA

Scientific and Technical Information (STI) Facility who rely on the following sources for their information: experts in the field, literature searches from the NASA STI database, and specialized references. Author

**N89-15779\*#** National Aeronautics and Space Administration, Washington, DC.

**THE NASA SCIENTIFIC AND TECHNICAL INFORMATION SYSTEM: ITS SCOPE AND COVERAGE**

Dec. 1988 216 p  
(NASA-SP-7065; NAS 1.21:7065) Avail: NTIS HC A10/MF A02 CSCL 05B

A general description of the subject areas covered in the NASA scientific and technical information system is presented. In addition, it establishes subject-based selection criteria for guiding decisions related to the addition of new documents to the NASA collection. Author

**N89-25775\*** National Aeronautics and Space Administration, Washington, DC.

**NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 35)**

Jun. 1989 38 p  
(NASA-SP-7039(35)-SECT-1; NAS 1.21:7039(35)-SECT-1) Avail: NTIS HC A03; NTIS standing order as PB89-911100, \$13.75 domestic, \$27.50 foreign CSCL 05B

Abstracts are provided for 58 patents and patent applications entered into the NASA scientific and technical information systems during the period January 1989 through June 1989. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. Author

**N89-29264\*** National Aeronautics and Space Administration, Washington, DC.

**NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES (SUPPLEMENT 35)**

Jan. 1989 512 p  
(NASA-SP-7039(35)-SECT-2; NAS 1.21:7039(35)-SECT-2) Avail: NTIS HC A22; NTIS standing order as PB89-911100, \$29.00 domestic, \$58.00 foreign CSCL 05B

A subject index is provided for over 4600 patents and patent applications for the period May 1969 through June 1989. Additional indexes list personal authors, corporate authors, contract numbers, NASA case numbers, U.S. patent class numbers, U.S. patent numbers, and NASA accession numbers. Author

**N90-1J782\*#** National Aeronautics and Space Administration, Washington, DC.

**NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS: A CATALOG OF SPECIAL PUBLICATIONS, REFERENCE PUBLICATIONS, CONFERENCE PUBLICATIONS, AND TECHNICAL PAPERS, 1988**

Feb. 1989 57 p  
(NASA-SP-7063(03); NAS 1.21:7063(03)) Avail: NTIS HC free as PR-849; NASA Scientific and Technical Information Facility, BWI Airport, MD free CSCL 05B

This catalog lists 179 citations of all NASA Special Publications, NASA Reference Publications, NASA Conference Publications, and NASA Technical Papers that were entered into the NASA scientific and technical information database during accession year 1988. The entries are grouped by subject category. Indexes of subject terms, personal authors, and NASA report numbers are provided. Author

**N90-22438\*#** National Aeronautics and Space Administration, Washington, DC.

**NASA THESAURUS SUPPLEMENT: A FOUR PART CUMULATIVE SUPPLEMENT TO THE 1988 EDITION OF THE NASA THESAURUS (SUPPLEMENT 3) Semiannual Report**

Mar. 1989 33 p  
(NASA-SP-7064-SUPPL-3; NAS 1.21:7064-SUPPL-3) Avail: NTIS HC A03/MF A01 CSCL 05B

The four-part cumulative supplement to the 1988 edition of

the NASA Thesaurus includes the Hierarchical Listing (Part 1), Access Vocabulary (Part 2), Definitions (Part 3), and Changes (Part 4). The semiannual supplement gives complete hierarchies and accepted upper/lowercase forms for new terms. Author

**N90-25698\*** National Aeronautics and Space Administration, Washington, DC.

**NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 37)**

Jan. 1989 43 p  
(NASA-SP-7039(37)-SECT-1; NAS 1.21:7039(37)-SECT-1) Avail: NTIS HC A04; NTIS standing order as PB89-911100, \$15.00 domestic, \$30.00 foreign CSCL 05B

Abstracts are provided for 76 patents and patent applications entered into the NASA scientific and technical information systems during the period January 1990 through June 1990. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. Author

**N90-26700\*** National Aeronautics and Space Administration, Washington, DC.

**NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES (SUPPLEMENT 37)**

Jan. 1989 507 p  
(NASA-SP-7039(37)-SECT-2; NAS 1.21:7039(37)-SECT-2) Avail: NTIS HC A22; NTIS standing order as PB90-911100, \$32.00 domestic, \$64.00 foreign CSCL 05B

A subject index is provided for over 4600 patents and patent applications for the period May 1969 through June 1990. Additional indexes list personal authors, corporate authors, contract numbers, NASA case numbers, U.S. patent class numbers, U.S. patent numbers, and NASA accession numbers. Author

**N90-26710\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**GRAMMAR, PUNCTUATION, AND CAPITALIZATION: A HANDBOOK FOR TECHNICAL WRITERS AND EDITORS**

MARY K. MCCASKILL Washington 1990 112 p  
(NASA-SP-7084; L-16617; NAS 1.21:7084) Avail: NTIS HC A06/MF A01 CSCL 05B

Writing problems are addressed which are often encountered in technical documents and preferences are indicated (Langley's) when authorities do not agree. It is directed toward professional writers, editors, and proofreaders. Those whose profession lies in other areas (for example, research or management), but who have occasion to write or review others' writing will also find this information useful. A functional attitude toward grammar and punctuation is presented. Chapter 1 on grammar presents grammatical problems related to each part of speech. Chapter 2 on sentence structure concerns syntax, that is, effective arrangement of words, with emphasis on methods of revision to improve writing effectiveness. Chapter 3 addresses punctuation marks, presenting their function, situations when they are required or incorrect, and situations when they are appropriate but optional. Chapter 4 presents capitalization, which is mostly a matter of editorial style and preference rather than a matter of generally accepted rules. An index and glossary are included. Author

**N90-27548\*#** National Aeronautics and Space Administration, Washington, DC.

**INFORMATION RESOURCES MANAGEMENT, 1984-1989: A BIBLIOGRAPHY WITH INDEXES**

May 1990 202 p  
(NASA-SP-7079; NAS 1.21:7079) Avail: NTIS HC A10 CSCL 05B

This bibliography contains 768 annotated references to reports and journal articles entered into the NASA scientific and technical information database 1984 to 1989. Author

## 84 LAW, POLITICAL SCIENCE AND SPACE POLICY

84

### LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

**N88-19375\*#** National Aeronautics and Space Administration, Washington, DC.

#### **SPACELAB: AN INTERNATIONAL SUCCESS STORY**

DOUGLAS R. LORD (Science Applications International Corp., Washington, D.C.) 1987 565 p Original contains color illustrations

(NASW-4092)

(NASA-SP-487; NAS 1.21:487; LC-86-17979) Avail: NTIS HC

A24/MF A03 CSCL 05D

Spacelab is a European-developed and U.S.-operated space laboratory carried in the cargo bay of the Space Shuttle Orbiter. This story of the Spacelab Development Program traces the program from the origin of the Spacelab concept, describing negotiations and agreements for European participation and the role of Europe and the United States in system development, operational capability development, and utilization planning. It also considers the joint management structure, coordination, and experience in solving management and technical interface problems. The book is not an exhaustive historical treatise, but an informative and readable story of the evolution and technical accomplishments of this unique program in manned space flight and of some of the unusual political and human interest aspects of the program from the viewpoint of one of the key participants.

Author

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### URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

**N87-70425\*** National Aeronautics and Space Administration, Washington, DC.

#### **SIGNIFICANT NASA INVENTIONS. AVAILABLE FOR LICENSING IN FOREIGN COUNTRIES**

1977 103 p

(NASA-SP-7038(04); NAS 1.21:7038(04)) Avail: SOD HC \$5.00

as 003-000-00986-1; NTIS MF A01

88

### SPACE SCIENCES (GENERAL)

**N87-23313\*#** National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

#### **DOUBLE LAYERS IN ASTROPHYSICS**

ALTON C. WILLIAMS, ed. and TAUNA W. MOOREHEAD, ed. May 1987 321 p Workshop held in Huntsville, Ala., 17-19 Mar. 1986; sponsored by NASA, Washington and USRA

(NASA-CP-2469; M-560; NAS 1.55:2469) Avail: NTIS HC

A14/MF A02 CSCL 03B

CONFERENCES, ELECTRIC FIELDS, ENERGY TRANSFER,

MATHEMATICAL MODELS, PLASMA LAYERS, PLASMA PHYSICS, SPACE PLASMAS

**N87-24247\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

#### **ESSAYS IN SPACE SCIENCE**

REUVEN RAMATY, ed., THOMAS L. CLINE, ed., and JONATHAN F. ORMES, ed. Jun. 1987 424 p Symposium held in Greenbelt, Md., 23 Apr. 1985

(NASA-CP-2464; REPT-87B0055; NAS 1.55:2464) Avail: NTIS

HC A18/MF A03 CSCL 03B

ASTROPHYSICS, CONFERENCES, COSMIC RAYS, GAMMA RAY ASTRONOMY, INFRARED ASTRONOMY, X RAY ASTRONOMY

**N87-28471\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

#### **CALCULATION AND ACCURACY OF ERBE SCANNER**

##### **MEASUREMENT LOCATIONS**

LAWRENCE H. HOFFMAN, WILLIAM L. WEAVER, and JAMES F. KIBLER Sep. 1987 34 p

(NASA-TP-2670; L-16218; NAS 1.60:2670) Avail: NTIS HC

A03/MF A01 CSCL 03B

COMPUTATION, EARTH ATMOSPHERE, EARTH RADIATION BUDGET EXPERIMENT, POSITION (LOCATION), REMOTE SENSING, SCANNING

**N88-25390\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

#### **A STUDY OF SPACE STATION CONTAMINATION EFFECTS**

M. R. TORR, ed., J. F. SPANN, ed., and T. W. MOOREHEAD, ed. May 1988 141 p Workshop held in Hilton Head Island, S.C., 29-30 Oct. 1987 Sponsored by NASA, Washington

(NASA-CP-3002; M-586; NAS 1.55:3002) Avail: NTIS HC

A07/MF A01 CSCL 22B

CONFERENCES, CONTAMINANTS, EARTH ORBITAL ENVIRONMENTS, SPACE STATIONS, SPACECRAFT CONTAMINATION

**N89-14188\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

#### **REPORT OF THE IN SITU RESOURCES UTILIZATION WORKSHOP**

KYLE FAIRCHILD, ed. and WENDELL W. MENDELL, ed. Nov. 1988 85 p Workshop held in Lake Buena Vista, Fla., 28-30

Jan. 1987; sponsored by NASA, DOE, Large Scale Programs Inst., United Technologies Corp., Kraft Foods and Disney Imagineering

(NASA-CP-3017; S-581; NAS 1.55:3017) Avail: NTIS HC

A05/MF A01 CSCL 03B

LUNAR EXPLORATION, SPACE COMMERCIALIZATION,

SPACE HABITATS, TECHNOLOGY ASSESSMENT

**N89-14189\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

#### **REMOTE SENSING IN POLARIZED LIGHT**

VICTOR S. WHITEHEAD and KINSELL L. COULSON (California Univ., Davis.) Oct. 1988 40 p Proceedings of Workshop held in Houston, Tex., 3-5 Nov. 1987

(NASA-CP-3014; S-577; NAS 1.55:3014) Avail: NTIS HC

A03/MF A01 CSCL 05B

CAMERAS, EARTH OBSERVATIONS (FROM SPACE), IMAGING TECHNIQUES, POLARIZATION (WAVES), RADIATIVE TRANSFER, SPACE SHUTTLE PAYLOADS

**N89-14998\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

#### **EXPERIMENTS IN PLANETARY AND RELATED SCIENCES AND THE SPACE STATION**

RONALD GREELEY, ed. (Arizona State Univ., Tempe.) and RICHARD J. WILLIAMS, ed. Washington, DC Nov. 1987 188 p Workshop held in Tempe, AZ, 15-16 Sep. 1986

(NCC9-14; NAS9-17023)

(NASA-CP-2494; S-566; NAS 1.55:2494) Avail: NTIS HC

A09/MF A02 CSCL 03B

ASTROPHYSICS, CONFERENCES, INTERSTELLAR CHEMISTRY, PARTICLE INTERACTIONS, ROBOTICS, SPACE STATION PAYLOADS, SPACEBORNE EXPERIMENTS

**N89-15790\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**SPACE STATION INDUCED MONITORING**

JAMES F. SPANN, ed. and MARSHA R. TORR, ed. Washington, DC Nov. 1988 85 p Conference held in Huntsville, AL, 10-11 May 1988 Sponsored by NASA, Washington (NASA-CP-3021; M-602; NAS 1.55:3021) Avail: NTIS HC A05/MF A01 CSCL 22B

AEROSPACE ENVIRONMENTS, ENVIRONMENTAL MONITORING, SPACE STATIONS, SPACECRAFT CHARGING

**N90-18329\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**SOLAR-TERRESTRIAL SCIENCE STRATEGY WORKSHOP**

PETER M. BANKS, ed., WILLIAM T. ROBERTS, ed., and JACK KROPP, ed. (TRW, Inc., Redondo Beach, CA.) Washington Sep. 1989 73 p Workshop held in Stanford, CA, 12-16 Sep. 1988 Original contains color illustrations

(NASA-CP-3048; M-617; NAS 1.55:3048) Avail: NTIS HC A04/MF A01; 4 functional color pages CSCL 03B

CONFERENCES, MISSION PLANNING, NASA PROGRAMS, SOLAR TERRESTRIAL INTERACTIONS, SPACEBORNE EXPERIMENTS, STRATEGY, TECHNOLOGY ASSESSMENT

**N90-27562\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**CARBON IN THE GALAXY: STUDIES FROM EARTH AND SPACE**

JILL C. TARTER, ed., SHERWOOD CHANG, ed., and DOUG J. DEFREES, ed. (Molecular Research Inst., Palo Alto, CA.) Washington Apr. 1990 350 p Meeting held at Moffett Field, CA, 5-6 Nov. 1987

(NASA-CP-3061; A-90031; NAS 1.55:3061) Avail: NTIS HC A15/MF A02 CSCL 03B

CARBON, COMETS, CONFERENCES, INTERPLANETARY DUST, INTERSTELLAR CHEMISTRY, METEORITIC DIAMONDS, MILKY WAY GALAXY

## 89

## ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy; and astrometry.

**N87-14219\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**TEN YEAR PLANETARY EPHEMERIS: 1986-1995**

F. ESPENAK Nov. 1986 249 p (NASA-RP-1176; NAS 1.61:1176; REPT-86B0471) Avail: NTIS HC A11/MF A02 CSCL 03A

Accurate geocentric positions are tabulated at five day intervals for the Sun, Mercury, Venus, Mars, Jupiter, Saturn, Uranus and Neptune during the ten year period 1986 through 1995. The apparent angular diameters, radial velocities, declinations and mean times of meridian transit of the seven planets and the Sun are graphically depicted for each year in the interval. Appendices are included which discuss the theory of planetary orbits and a FORTRAN program for calculating planetary ephemerides.

Author

**N87-22573\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**INFRARED SOURCE CROSS-INDEX, FIRST EDITION**

MARION SCHMITZ (Computer Sciences Corp., Beltsville, Md.),

JAYLEE M. MEAD, and DANIEL Y. GEZARI Apr. 1987 323 p (NASA-RP-1182; REPT-87B0058; NAS 1.61:1182) Avail: NTIS HC A14/MF A02 CSCL 03A

The Infrared Source Cross-Index is a listing of correlated infrared source names (and positions) for astronomical objects observed at 1-1000 microns. The source names have been obtained from the database of the first edition of the Catalog of Infrared Observations (CIO: NASA RP 1118), covering observations published through 1982. Additional identifications were located by correlating these names with identifications contained in other machine-readable astronomical catalogs in the NASA National Space Science Data Center (NSSDC). There are some 80,000 different source names in the Cross-Index, corresponding to over 27,000 unique infrared sources.

Author

**N87-24266\*#** National Aeronautics and Space Administration, Washington, DC.

**STAR FORMATION IN GALAXIES**

May 1987 755 p Conference held in Pasadena, Calif., 16-19 Jun. 1986

(NASA-CP-2466; NAS 1.55:2466) Avail: NTIS HC A99/MF E06 CSCL 03A

CONFERENCES, GALACTIC STRUCTURE, GALAXIES, INFRARED ASTRONOMY, MOLECULAR CLOUDS, RADIO ASTRONOMY, STAR FORMATION, STELLAR LUMINOSITY

**N87-25906\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**FIFTY YEAR CANON OF SOLAR ECLIPSES: 1986 - 2035**

FRED ESPENAK Jul. 1987 272 p (NASA-RP-1178-REV; REPT-87B0252; NAS 1.61:1178-REV) Avail: NTIS HC A12/MF A02 CSCL 03A

A complete catalog is presented, listing the general characteristics of every solar eclipse from 1901 through 2100. To complement this catalog, a detailed set of cylindrical projection world maps shows the umbral paths of every solar eclipse over the 200 year interval. Focusing in on the next 50 years, accurate geodetic path coordinates and local circumstances for the 71 central eclipses from 1987 through 2035 are tabulated. Finally, the geodetic paths of the umbral and penumbral shadows of all 109 solar eclipses in this period are plotted on orihographic projection maps of the Earth. Appendices are included which discuss eclipse geometry, eclipse frequency and occurrence, modern eclipse prediction and time determination. Finally, code for a simple Fortran program is given to predict the occurrence and characteristics of solar eclipses.

Author

**N88-15738\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**CATALOG OF INFRARED OBSERVATIONS. PART 1: DATA Second Edition**

DANIEL Y. GEZARI, MARION SCHMITZ (Computer Sciences Corp., Beltsville, Md.), and JAYLEE M. MEAD Dec. 1987 625 p (NASA-RP-1196-PT-1-ED-2; NAS 1.61:1196-PT-1-ED-2) Avail: NTIS HC A99/MF A04 CSCL 03A

The Catalog of Infrared Observations (CIO) is a compilation of infrared astronomical observational data obtained from an extensive literature search of astronomical journals and major astronomical catalogs and surveys. The literature searches are complete for 1965 through 1986 in this Second Edition. The Catalog is published in two parts, with the observational data (roughly 200,000 observations of 20,000 individual sources) listed in Part I, and supporting appendices in Part II. The expanded Second Edition contains a new feature: complete IRAS 4-band data for all CIO sources detected, listed with the main Catalog observations, as well as in complete detail in the Appendix. The appendices include an atlas of infrared source positions, two bibliographies of infrared literature upon which the search was based, and, keyed to the main Catalog listings (organized alphabetically by author and then chronologically), an atlas of infrared spectral ranges, and IRAS data from the CIO sources. The complete CIO database is available to qualified users in printed microfiche and magnetic tape formats.

Author

**N88-16615\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

**CATALOG OF INFRARED OBSERVATIONS. PART 2: APPENDICES Second Edition**

DANIEL Y. GEZARI, MARION SCHMITZ, and JAYLEE M. MEAD  
Dec. 1987 343 p  
(NASA-RP-1196-PT-2-ED-2; NAS 1.61:1196-PT-2-ED-2) Avail:  
NTIS HC A15/MF A02 CSCI 03A

The Catalog of Infrared Observations (CIO) is a compilation of infrared astronomical observational data obtained from an extensive literature search of astronomical journals and major astronomical catalogs and surveys. The literature searches are complete for years 1965 to 1986. Supporting appendixes are published in this part. The appendixes include an atlas of infrared source positions, two bibliographies of infrared literature upon which the search was based, and, keyed to the main Catalog listings (organized alphabetically by first author, and by date), an atlas of infrared spectral ranges, and IRAS data for the CIO sources. The complete CIO database is available to qualified users in printed microfiche and magnetic tape formats. Author

**N88-24553\*#** National Aeronautics and Space Administration, Washington, DC.

**NASA THESAURUS: ASTRONOMY VOCABULARY**

1988 112 p Presented at the International Astronomical Union Conference, Baltimore, Md., 27-31 Jul. 1988  
(NASA-SP-7069; NAS 1.21:7069) Avail: NTIS HC A06 CSCI 03A

A terminology of descriptors used by the NASA Scientific and Technical information effort to index documents in the area of astronomy is presented. The terms are listed in hierarchical format derived from the 1988 edition of the NASA Thesaurus Volume 1 -- Hierarchical Listing. Over 1600 terms are included. In addition to astronomy, space sciences covered include astrophysics, cosmology, lunar flight and exploration, meteors and meteorites, celestial mechanics, planetary flight and exploration, and planetary science. Author

**N88-30545\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

**FAR INFRARED SUPPLEMENT: CATALOG OF INFRARED OBSERVATIONS, SECOND EDITION**

DANIEL Y. GEZARI, MARION SCHMITZ (Computer Sciences Corp., Beltsville, Md.), and JAYLEE M. MEAD Aug. 1988 233 p  
(NASA-RP-1205; REPT-88B-121; NAS 1.61:1205) Avail: NTIS HC A11/MF A02 CSCI 03A

The Far Infrared Supplement: Catalog of Infrared Observations summarizes all infrared astronomical observations at far infrared wavelengths (5 to 1000 microns) published in the scientific literature from 1965 through 1986. The Supplement list contain 25 percent of the observations in the full Catalog of Infrared Observations (CIO), and essentially eliminates most visible stars from the listings. The Supplement is thus more compact than the main catalog, and is intended for easy reference during astronomical observations. The Far Infrared Supplement (2nd Edition) includes the Index of Infrared Source Positions and the Bibliography of Infrared Astronomy for the subset of far infrared observations listed. Author

**N89-11657\*#** National Aeronautics and Space Administration, Washington, DC.

**O STARS AND WOLF-RAYET STARS**

PETER S. CONTI, ANNE B. UNDERHILL, STUART JORDAN, ed., and RICHARD THOMAS, ed. 1988 508 p Prepared in cooperation with Centre National de la Recherche Scientifique, Paris (France)  
(NASA-SP-497; NAS 1.21:497) Avail: SOD HC \$24.00 as 033-000-01021-4; NTIS A01 CSCI 03A

Basic information is given about O and Wolf-Rayet stars indicating how these stars are defined and what their chief observable properties are. Part 2 of the volume discussed four related themes pertaining to the hottest and most luminous stars. Presented are: an observational overview of the spectroscopic

classification and extrinsic properties of O and Wolf-Rayet stars; the intrinsic parameters of luminosity, effective temperature, mass, and composition of the stars, and a discussion of their viability; stellar wind properties; and the related issues concerning the efforts of stellar radiation and wind on the immediate interstellar environment are presented. B.G.

**N89-12513\*#** National Aeronautics and Space Administration, Washington, DC.

**ATLAS OF GALAXIES USEFUL FOR MEASURING THE COSMOLOGICAL DISTANCE SCALE**

ALLAN SANDAGE and JOHN BEDKE (Space Telescope Science Inst., Baltimore, Md.) 1988 462 p Prepared for Computer Sciences Corp., Baltimore, Md. Prepared in cooperation with Johns Hopkins Univ., Baltimore, Md.  
(NASA-SP-496; NAS 1.21:496; LC-88-600056) Avail: NTIS HC A20; also available SOD HC \$80.00 as 033-000-01020-6 CSCI 03A

A critical first step in determining distances to galaxies is to measure some property of primary objects such as stars of specific types, H II regions, and supernovae remnants that are resolved out of the general galactic star content. With the completion of the Mount Wilson/Palomar/Las Campanas survey of bright galaxies in 1985, excellent large-scale photographs of the complete Shapley-Ames sample were on hand. Most of the galaxies useful for distance scale calibration are in this collection. This atlas contains photographs of 322 galaxies including the majority of all Shapley-Ames bright galaxies, plus cluster members in the Virgo Cluster core that might be usefully resolved by the Hubble Space Telescope (HST). Because of crowding and high background-disk surface brightness, the choice of field position is crucial for programs involving resolution of particular galaxies into stars. The purpose of this atlas is to facilitate this choice. Enough information is given herein (coordinates of the galaxy centers and the scale of the photography) to allow optimum placement of the HST wide-field planetary camera format of approximately 150 arc-seconds on a side. Author

**N89-13310\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

**SECOND WORKSHOP ON IMPROVEMENTS TO PHOTOMETRY**

WILLIAM J. BORUCKI, ed. Sep. 1988 314 p Workshop held in Gaithersburg, Md., 5-6 Oct. 1987; sponsored by NASA, Ames Research Center, Moffett Field, Calif. and NBS, Gaithersburg, Md.  
(NASA-CP-10015; A-88125; NAS 1.55:10015) Avail: NTIS HC A14/MF A02 CSCI 03A

**ASTRONOMICAL PHOTOMETRY, CONFERENCES, FIBER OPTICS, PHOTOMETERS**

**N89-13330\*#** National Aeronautics and Space Administration, Washington, DC.

**INFRARED OBSERVATIONS OF COMETS HALLEY AND WILSON AND PROPERTIES OF THE GRAINS**

MARTHA S. HANNER, ed. (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) Sep. 1988 200 p Workshop held at Ithaca, N.Y., 10-12 Aug. 1987  
(NASA-CP-3004; NAS 1.55:3004) Avail: NTIS HC A09/MF A02 CSCI 03A

**COMETARY ATMOSPHERES, COSMIC DUST, HALLEY'S COMET, INFRARED SPECTRA**

**N89-15810\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

**FUTURE ASTRONOMICAL OBSERVATORIES ON THE MOON**

JACK O. BURNS, ed. (New Mexico Univ., Albuquerque.) and WENDELL W. MENDELL, ed. Washington, DC Mar. 1988 129 p Workshop held in Houston, TX, 10 Jan. 1986; sponsored by NASA, Johnson Space Flight Center, Houston, TX and American Astronomical Society, Washington, DC  
(NASA-CP-2489; S-569; NAS 1.55:2489) Avail: NTIS HC A07/MF A01 CSCI 03A

**ASTRONOMICAL OBSERVATORIES, LUNAR BASES, LUNAR OBSERVATORIES, RADIO ASTRONOMY, RADIO TELESCOPES**



**N90-10805\*#** New Mexico Univ., Albuquerque. Inst. for Astrophysics.

**A LUNAR FAR-SIDE VERY LOW FREQUENCY ARRAY**

JACK O. BURNS, ed., NEBOJSA DURIC, ed., STEWART JOHNSON, ed. (BDM Corp., Albuquerque, NM.), and G. JEFFREY TAYLOR, ed. Nov. 1989 75 p Workshop held in Albuquerque, NM, 18-19 Feb. 1988; sponsored by NASA, Washington, New Mexico Univ., Albuquerque, and BDM Corp., Albuquerque, NM Sponsored by NASA, Washington (NASA-CP-3039; NAS 1.55:3039) Avail: NTIS HC A04/MF A01 CSCL 03A

ARRAYS, CONFERENCES, LIBRATION, LUNAR BASES, MOON, RADIO ASTRONOMY, STRUCTURAL DESIGN, VERY LOW FREQUENCIES

**N90-10807\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**AUTOMATIC CLASSIFICATION OF SPECTRA FROM THE INFRARED ASTRONOMICAL SATELLITE (IRAS)**

PETER CHEESEMAN, JOHN STUTZ, MATTHEW SELF, WILLIAM TAYLOR (Sterling Federal Systems, Inc., Palo Alto, CA.), JOHN GOEBEL, KEVIN VOLK, and HELEN WALKER Mar. 1989 595 p (NASA-RP-1217; NAS 1.61:1217) Avail: NTIS HC A25/MF A04 CSCL 03A

A new classification of Infrared spectra collected by the Infrared Astronomical Satellite (IRAS) is presented. The spectral classes were discovered automatically by a program called Auto Class 2. This program is a method for discovering (inducing) classes from a data base, utilizing a Bayesian probability approach. These classes can be used to give insight into the patterns that occur in the particular domain, in this case, infrared astronomical spectroscopy. The classified spectra are the entire Low Resolution Spectra (LRS) Atlas of 5,425 sources. There are seventy-seven classes in this classification and these in turn were meta-classified to produce nine meta-classes. The classification is presented as spectral plots, IRAS color-color plots, galactic distribution plots and class commentaries. Cross-reference tables, listing the sources by IRAS name and by Auto Class class, are also given. These classes show some of the well known classes, such as the black-body class, and silicate emission classes, but many other classes were unsuspected, while others show important subtle differences within the well known classes. Author

**N90-18342\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**FIFTY YEAR CANON OF LUNAR ECLIPSES: 1986-2035**

FRED ESPENAK Mar. 1989 221 p (NASA-RP-1216; REPT-89B00056; NAS 1.61:1216) Avail: NTIS HC A10/MF A02 CSCL 03A

A complete catalog is presented, listing the general circumstances of every lunar eclipse from 1901 through 2100. To compliment this catalog, a set of figures illustrate the basic Moon-shadow geometry and global visibility for every lunar eclipse over the 200 year interval. Focusing in on the next fifty years, 114 detailed diagrams show the Moon's path through Earth's shadow during every eclipse, including contact times at each phase. The accompanying cylindrical projection maps of Earth show regions of hemispheric visibility for all phases. The appendices discuss eclipse geometry, eclipse frequency and recurrence, enlargement of Earth's shadow, crater timings, eclipse brightness and time determination. Finally, a simple FORTRAN program is provided which can be used to predict the occurrence and general characteristics of lunar eclipses. This work is a companion volume to NASA Reference Publication 1178: Fifty Year Canon of Solar Eclipses: 1986-2035. Author

**N90-28470\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**SPATIAL INTERFEROMETRY IN OPTICAL ASTRONOMY**

DANIEL Y. GEZARI, FRANCOIS RODDIER, and CLAUDE RODDIER (Hawaii Univ., Honolulu.) Washington Sep. 1990

249 p

(NASA-RP-1245; REPT-90-069; NAS 1.61:1245) Avail: NTIS HC A11/MF A02 CSCL 03A

A bibliographic guide is presented to publications of spatial interferometry techniques applied to optical astronomy. Listings appear in alphabetical order, by first author, as well as in specific subject categories listed in chronological order, including imaging theory and speckle interferometry, experimental techniques, and observational results of astronomical studies of stars, the Sun, and the solar system. Author

90

ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

**N87-30235\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**ATLAS OF COMET HALLEY 1910 II**

BERTRAM DONN, JUERGEN RAHE, and JOHN C. BRANDT 1986 597 p

(NASA-SP-488; NAS 1.21:488; LC-86-16341) Avail: SOD HC \$48.00 as 033-000-00991-7; NTIS MF A01 CSCL 03B

With the impending return of Halley's Comet in 1986, a major effort began to collect the material obtained at its last appearance in 1910. This material displays the evolving coma and tail phenomena, and is useful for comparison with the present quantitative studies of spectroscopic and structural phenomena. Images in the atlas are arranged in chronological order by day. Days that have multiple images with varying scale are arranged in two sequences. Photographs showing tail phenomena are first, followed by photographs obtained with longer focus instruments showing the head or near-nuclear region. Drawings of Comet Halley, made from visual observations in 1835 and 1910, also are included. B.G.

**N88-11592\*#** National Aeronautics and Space Administration. Washington, DC.

**THE M-TYPE STARS**

HOLLIS RALPH JOHNSON, FRANCOIS R. QUERCI, STUART JORDAN, ed., RICHARD THOMAS, ed., LEO GOLDBERG (Kitt Peak National Observatory, Tucson, Ariz.), and JEAN-CLAUDE PECKER 1987 576 p Prepared in cooperation with CNRS, Paris, France Its Monograph Series on Nonthermal Phenomena in Stellar Atmospheres, Volume 5

(NASA-SP-492; NAS 1.21:492; LC-87-11340) Avail: SOD HC \$26.00 as 033-000-01007-9; NTIS MF A01 CSCL 03B

The papers in this volume cover the following topics: (1) basic properties and photometric variability of M and related stars; (2) spectroscopy and nonthermal processes; (3) circumstellar radio molecular lines; (4) circumstellar shells, the formation of grains, and radiation transfer; (5) mass loss; (6) circumstellar chemistry; (7) thermal atmospheric models; (8) quasi-thermal models; (9) observations on the atmospheres of M dwarfs; and (1) theoretical work on M dwarfs. For individual titles, see N88-11593 through N88-11602.

**N88-20235\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**WORKSHOP ON TECHNOLOGY DEVELOPMENT ISSUES FOR THE LARGE DEPLOYABLE REFLECTOR (LDR)**

KENJI NISHIOKA, ed. Feb. 1986 118 p Workshop held in Asilomar, Calif., 17-22 Mar. 1985

(NASA-CP-2407; A-85394; NAS 1.55:2407) Avail: NTIS HC A06/MF A01 CSCL 03B

CRYOGENIC COOLING, DEPLOYMENT, INFRARED ASTRONOMY, INFRARED TELESCOPES, LARGE DEPLOYABLE

## 90 ASTROPHYSICS

### REFLECTOR, LARGE SPACE STRUCTURES, REFLECTORS, TECHNOLOGY ASSESSMENT

**N88-28843\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

#### **INTERNATIONAL ULTRAVIOLET EXPLORER SPECTRAL ATLAS OF PLANETARY NEBULAE, CENTRAL STARS, AND RELATED OBJECTS**

WALTER A. FEIBELMAN, NANCY A. OLIVERSEN, JOY NICHOLSBOHLIN, and MATTHEW P. GARHART (Computer Sciences Corp., Beltsville, Md.) Jun. 1988 380 p (NAS5-28749) (NASA-RP-1203; NAS 1.61:1203) Avail: NTIS HC A17 CSCL 03B

The International Ultraviolet Explorer (IUE) archives contain a wealth of information on high quality ultraviolet spectra of approximately 180 planetary nebulae, their central stars, and related objects. Selected are representative low-dispersion IUE spectra in the range 1200 to 3200 Å for 177 objects arranged by Right Ascension (RA) for this atlas. For most entries, the combined short wavelength (SWP) (1200 to 1900) and long wavelength (LWR) (or LWP, 1900 to 3200 Å) regions are shown on 30 cm by 10 cm Calcomp plots on a uniform scale to facilitate intercomparison of the spectra. Each calibrated spectrum is also shown on an expanded vertical scale to bring out some of the weaker features.

Author

**N88-29652\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

#### **CATALOG OF OPEN CLUSTERS AND ASSOCIATED INTERSTELLAR MATTER**

DAVID LEISAWITZ Jun. 1988 294 p (NASA-RP-1202; REPT-88B0152; NAS 1.61:1202) Avail: NTIS HC A13/MF A02 CSCL 03B

The Catalog of Open Clusters and Associated Interstellar Matter summarizes observations of 128 open clusters and their associated ionized, atomic, and molecular interstellar matter. Cluster sizes, distances, radial velocities, ages, and masses, and the radial velocities and masses of associated interstellar medium components, are given. The database contains information from approximately 400 references published in the scientific literature before 1988.

Author

**N89-14194\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

#### **INFRARED ASTRONOMICAL SATELLITE (IRAS) CATALOGS AND ATLASES. VOLUME 1: EXPLANATORY SUPPLEMENT**

C. A. BEICHMAN, ed., G. NEUGEBAUER, ed., H. J. HABING, ed., P. E. CLEGG, ed., and THOMAS J. CHESTER, ed. (California Inst. of Tech., Pasadena.) Washington, D.C. 1988 455 p Prepared in cooperation with Netherlands Agency for Aerospace Programs, Delft, and Science Research Council, London, United Kingdom Sponsored by NASA, Washington (NASA-RP-1190-VOL-1; NAS 1.61:1190-VOL-1) Avail: NTIS HC A20/MF A03; also available SOD CSCL 03B

The Infrared Astronomical Satellite (IRAS) was launched on January 26, 1983. During its 300-day mission, IRAS surveyed over 96 pct of the celestial sphere at four infrared wavelengths, centered approximately at 12, 25, 60, and 100 microns. Volume 1 describes the instrument, the mission, and data reduction.

Author

**N89-14195\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

#### **INFRARED ASTRONOMICAL SATELLITE (IRAS) CATALOGS AND ATLASES. VOLUME 5: THE POINT SOURCE CATALOG DECLINATION RANGE -30 DEG GREATER THAN DELTA GREATER THAN -50 DEG**

Washington, D.C. 1988 410 p Prepared in cooperation with Netherlands Agency for Aerospace Programs, Delft, and Science Research Council, London, United Kingdom Sponsored by NASA, Washington (NASA-RP-1190-VOL-5; NAS 1.61:1190-VOL-5) Avail: NTIS HC A18/MF A03; also available SOD CSCL 03B

The Infrared Astronomical Satellite (IRAS) was launched January 26, 1983. During its 300-day mission, IRAS surveyed over 96 pct of the celestial sphere at four infrared wavelengths, centered approximately at 12, 25, 60, and 100 microns. This is Volume 5, The Point Source Catalog Declination Range -30 deg greater than delta greater than -50 deg.

Author

**N89-14196\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

#### **INFRARED ASTRONOMICAL SATELLITE (IRAS) CATALOGS AND ATLASES. VOLUME 4: THE POINT SOURCE CATALOG DECLINATION RANGE 0 DEG GREATER THAN DELTA GREATER THAN -30 DEG**

Washington, D.C. 1988 596 p Prepared in cooperation with Netherlands Agency for Aerospace Programs, Delft, and Science Research Council, London, United Kingdom Sponsored by NASA, Washington (NASA-RP-1190-VOL-4; NAS 1.61:1190-VOL-4) Avail: NTIS HC A25/MF A04; also available SOD CSCL 03B

The Infrared Astronomical Satellite (IRAS) was launched 26 January 1983. During its 300-day mission, it surveyed over 96 pct of the celestial sphere at four infrared wavelengths, centered approximately at 12, 25, 60, and 100 microns. This is Volume 4, The Point Source Catalog Declination Range 0 deg greater than delta greater than -30 deg.

Author

**N89-14197\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

#### **INFRARED ASTRONOMICAL SATELLITE (IRAS) CATALOGS AND ATLASES. VOLUME 2: THE POINT SOURCE CATALOG DECLINATION RANGE 90 DEG GREATER THAN DELTA GREATER THAN 30 DEG**

Washington, D.C. 1988 555 p Prepared in cooperation with Netherlands Agency for Aerospace Programs, Delft, and Science Research Council, London, United Kingdom Sponsored by NASA, Washington (NASA-RP-1190-VOL-2; NAS 1.61:1190-VOL-2) Avail: NTIS HC A24/MF A03; also available SOD CSCL 03B

The Infrared Astronomical Satellite (IRAS) was launched January 26, 1983. During its 300-day mission, IRAS surveyed 96 pct of the celestial sphere at four infrared wavelengths, centered approximately at 12, 25, 60, and 100 microns. This is Volume 2, The Point Source Catalog Declination Range 90 deg greater than delta greater than 30 deg.

Author

**N89-14198\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

#### **INFRARED ASTRONOMICAL SATELLITE (IRAS) CATALOGS AND ATLASES. VOLUME 6: THE POINT SOURCE CATALOG DECLINATION RANGE -50 DEG GREATER THAN DELTA GREATER THAN -90 DEG**

Washington, D.C. 1988 473 p Prepared in cooperation with Netherlands Agency for Aerospace Programs, Delft, and Science Research Council, London, United Kingdom Sponsored by NASA, Washington (NASA-RP-1190-VOL-6; NAS 1.61:1190-VOL-6) Avail: NTIS HC A20/MF A03; also available SOD CSCL 03B

The Infrared Astronomical Satellite (IRAS) was launched January 26, 1983. During its 300-day mission, it surveyed over 96 pct of the celestial sphere at four infrared wavelengths, centered approximately at 12, 25, 60, and 100 microns. This is Volume 6, The Point Source Catalog Declination Range -50 deg greater than delta greater than -90 deg.

Author

**N89-14199\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

#### **INFRARED ASTRONOMICAL SATELLITE (IRAS) CATALOGS AND ATLASES. VOLUME 7: THE SMALL SCALE STRUCTURE CATALOG**

GEORGE HELOU, ed. and D. W. WALKER, ed. Washington, D.C. 1988 348 p Prepared in cooperation with Netherlands Agency for Aerospace Programs, Delft, and Science Research Council, London, United Kingdom Sponsored by NASA,

## 91 LUNAR AND PLANETARY EXPLORATION

Washington

(NASA-RP-1190-VOL-7; NAS 1.61:1190-VOL-7) Avail: NTIS HC A15/MF A02; also available SOD CSCL 03B

The Infrared Astronomical Satellite (IRAS) was launched January 26, 1983. During its 300-day mission, it surveyed over 96 pct of the celestial sphere at four infrared wavelengths, centered approximately at 12, 25, 60, and 100 microns. Volume 1 describes the instrument, the mission, and the data reduction process. Volumes 2 through 6 present the observations of the approximately 245,000 individual point sources detected by IRAS; each volume gives sources within a specified range of declination. Volume 7 gives the observations of the approximately 16,000 sources spatially resolved by IRAS and smaller than 8'. This is Volume 7, The Small Scale Structure Catalog. Author

**N89-14201\*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

### **INFRARED ASTRONOMICAL SATELLITE (IRAS) CATALOGS AND ATLASES. VOLUME 3: THE POINT SOURCE CATALOG DECLINATION RANGE 30 DEG GREATER THAN DELTA GREATER THAN 0 DEG**

Washington, D.C. 1988 493 p Prepared in cooperation with Netherlands Agency for Aerospace Programs, Delft, and Science Research Council, London, United Kingdom Sponsored by NASA, Washington

(NASA-RP-1190-VOL-3; NAS 1.61:1190-VOL-3) Avail: NTIS HC A21/MF A03; also available SOD CSCL 03B

The Infrared Astronomical Satellite (IRAS) was launched January 26, 1983. During its 300-day mission, IRAS surveyed over 96 pct of the celestial sphere at four infrared wavelengths, centered approximately at 12, 25, 60, and 100 microns. This is Volume 3, The Point Source Catalog Declination Range 30 deg greater than delta greater than 0 deg. Author

**N89-27612\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

### **COMMENTARY ON INTERSTELLAR MATTER ASSOCIATED WITH 18 OPEN CLUSTERS**

DAVID LEISAWITZ Washington Sep. 1989 20 p Sponsored by National Research Council

(R033-87; NSF AST-81-6403; NSF AST-83-12332)

(NASA-RP-1229; REPT-89B00238; NAS 1.61:1229) Avail: NTIS HC A03/MF A01 CSCL 03B

Information supplementary to that contained in Section 4 of an article entitled, A CO Survey of Regions Around 34 Open Clusters, (Leisawitz, Bash, and Thaddeus) published in the Astrophysical Journal Supplement Series, Volume 70, Number 4, August 1989 is summarized. The information presented here, which describes the interstellar environments of young clusters and some cluster physical characteristics, comes from observations published in the astronomical literature and the author's carbon monoxide (CO) emission line survey, and may help clarify our understanding of the interaction of massive stars with the interstellar medium. Author

**N90-18344\*#** National Aeronautics and Space Administration, Washington, DC.

### **FGK STARS AND T TAURI STARS: MONOGRAPH SERIES ON NONTHERMAL PHENOMENA IN STELLAR ATMOSPHERES**

LAWRENCE E. CRAM, ed. and LEONARD V. KUHL, ed. (California Univ., Berkeley.) 1989 353 p Prepared in cooperation with Centre National de la Recherche Scientifique, Paris, France (NASA-SP-502; NAS 1.21:502; LC-89-600317) Avail: NTIS HC A16/MF A02; also available SOD HC \$18.00 as 033-000-01073-7 CSCL 03B

The purpose of this book, FGK Stars and T Tauri Stars, like all other volumes of this series, is to exhibit and describe the best space data and ground based data currently available, and also to describe and critically evaluate the status of current theoretical models and physical mechanisms that have been proposed to interpret these data. The method for obtaining this book was to collect manuscripts from competent volunteer authors, and then to collate and edit these contributions to form a well

structured book, which will be distributed to an international community of research astronomers by NASA and by the French CNRS. Author

**N90-19940\*#** National Aeronautics and Space Administration, Washington, DC.

### **RELATIVISTIC GRAVITATIONAL EXPERIMENTS IN SPACE**

RONALD W. HELLINGS, ed. Aug. 1989 242 p Workshop held in Annapolis, MD, 28-30 Jun. 1988 (NASA-CP-3046; NAS 1.55:3046) Avail: NTIS HC A11/MF A02 CSCL 03B

BLACK HOLES (ASTRONOMY), GRAVITATIONAL WAVES, RELATIVITY, SPACEBORNE EXPERIMENTS

**N90-23294\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

### **THE ENERGETIC GAMMA-RAY EXPERIMENT TELESCOPE (EGRET) SCIENCE SYMPOSIUM**

CARL E. FICHEL, ed., STANLEY D. HUNTER, ed., PARAMESWARAN SREEKUMAR, ed., and FLOYD W. STECKER, ed. May 1990 327 p Symposium held in Greenbelt, MD, 15-16 Nov. 1989 Original contains color illustrations (NASA-CP-3071; NAS 1.55:3071) Avail: NTIS HC A15/MF A02; 1 functional color page CSCL 03B

CONFERENCES, GALACTIC COSMIC RAYS, GALACTIC RADIATION, GALACTIC STRUCTURE, GAMMA RAY ASTRONOMY, GAMMA RAY OBSERVATORY, GAMMA RAY TELESCOPES

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## LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

**N87-17598\*#** National Aeronautics and Space Administration, Goddard Inst. for Space Studies, New York, NY.

### **THE JOVIAN ATMOSPHERES**

MICHAEL ALLISON, ed. and LARRY D. TRAVIS, ed. Oct. 1986 129 p Conference held in New York, N.Y., 6-8 May 1985 Submitted for publication (NASA-CP-2441; NAS 1.55:2441) Copyright Avail: NTIS HC A07/MF A01 CSCL 84B

ATMOSPHERIC CHEMISTRY, CLOUDS (METEOROLOGY), GAS DYNAMICS, GAS GIANT PLANETS, HYDROGEN, JUPITER ATMOSPHERE, NEPTUNE ATMOSPHERE, SATURN ATMOSPHERE, SPACE EXPLORATION, SYNOPTIC METEOROLOGY, THERMODYNAMICS, URANUS ATMOSPHERE

**N87-19322\*#** National Aeronautics and Space Administration, Washington, DC.

### **STATUS AND FUTURE OF LUNAR GEOSCIENCE**

1986 63 p (NASA-SP-484; NAS 1.21:484) Avail: SOD HC \$4.25 as 033-000-00997-6; NTIS MF A01 CSCL 03B

The Moon is of special interest among the many and diverse bodies of the solar system because it serves as a scientific baseline for understanding the terrestrial planets, its origin is closely tied to the early history of the Earth, and its proximity permits a variety of space applications such as mining and establishment of bases and colonies. Data acquisition and analysis have enabled advances to be made and the remaining questions in many fields of lunar geoscience to be identified. The status and unresolved problems of lunar science are discussed. Immediate needs, new unmanned missions, and a return to the Moon (a lunar base) are examined. B.G.

## 91 LUNAR AND PLANETARY EXPLORATION

**N88-24564\*#** National Aeronautics and Space Administration, Washington, DC.

### **REFLECTANCE SPECTROSCOPY IN PLANETARY SCIENCE: REVIEW AND STRATEGY FOR THE FUTURE**

THOMAS B. MCCORD, ed. (Hawaii Univ., Honolulu.) Jun. 1987 43 p

(NASA-SP-493; NAS 1.21:493; LC-87-28154) Avail: NTIS HC A03/MF A01 CSCL 03B

Reflectance spectroscopy is a remote sensing technique used to study the surfaces and atmospheres of solar system bodies. It provides first-order information on the presence and amounts of certain ions, molecules, and minerals on a surface or in an atmosphere. Reflectance spectroscopy has become one of the most important investigations conducted on most current and planned NASA Solar System Exploration Program space missions. This book reviews the field of reflectance spectroscopy, including information on the scientific technique, contributions, present conditions, and future directions and needs. Author

**N88-26279\*#** National Aeronautics and Space Administration, Washington, DC.

### **PLANETARY GEOLOGY: GOALS, FUTURE DIRECTIONS, AND RECOMMENDATIONS Final Report**

Aug. 1988 23 p Workshop held in Tempe, Ariz., Jan. 1987

(NASA-CP-3005; NAS 1.55:3005) Avail: NTIS HC A03/MF A01 CSCL 03B

PLANETARY GEOLOGY, PLANETOLOGY, SPACE EXPLORATION

**N89-16709\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

### **THE CASSINI MISSION: INFRARED AND MICROWAVE SPECTROSCOPIC MEASUREMENTS**

V. G. KUNDE Jan. 1989 127 p

(NASA-RP-1213; NAS 1.61:1213; REPT-89B0006) Avail: NTIS HC A07/MF A01 CSCL 03B

The Cassini Orbiter and Titan Probe model payloads include a number of infrared and microwave instruments. This document describes: (1) the fundamental scientific objectives for Saturn and Titan which can be addressed by infrared and microwave instrumentation, (2) the instrument requirements and the accompanying instruments, and (3) the synergism resulting from the comprehensive coverage of the total infrared and microwave spectrum by the complement of individual instruments. The baseline consists of four instruments on the orbiter and two on the Titan probe. The orbiter infrared instruments are: (1) a microwave spectrometer and radiometer; (2) a far to mid-infrared spectrometer; (3) a pressure modulation gas correlation spectrometer, and (4) a near-infrared grating spectrometer. The two Titan probe infrared instruments are: (1) a near-infrared instrument, and (2) a tunable diode laser infrared absorption spectrometer and nephelometer. Author

**N89-18373\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

### **PROCEEDINGS OF THE POLAR PROCESSES ON MARS WORKSHOP**

ROBERT M. HABERLE Dec. 1988 59 p Workshop held in Sunnyvale, CA, 12-13 May 1988

(NASA-CP-10021; A-89001; NAS 1.55:10021) Avail: NTIS HC A04/MF A01 CSCL 03B

CONFERENCES, MARS (PLANET), MARS ATMOSPHERE, POLAR REGIONS

**N89-28474\*#** National Aeronautics and Space Administration, Washington, DC.

### **TIME-VARIABLE PHENOMENA IN THE JOVIAN SYSTEM**

MICHAEL J. S. BELTON, ed., ROBERT A. WEST, ed. (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), JURGEN RAHE, ed., and MARGARITA PEREYDA 1989 406 p Workshop held in Flagstaff, AZ, 25-27 Aug. 1987 Original contains color illustrations

(NASA-SP-494; NAS 1.21:494; LC-88-25450) Avail: NTIS HC A18/MF A03 CSCL 03B

The current state of knowledge of dynamic processes in the Jovian system is assessed and summaries are provided of both theoretical and observational foundations upon which future research might be based. There are three sections: satellite phenomena and rings; magnetospheric phenomena, Io's torus, and aurorae; and atmospheric phenomena. Each chapter discusses time dependent theoretical framework for understanding and interpreting what is observed; others describe the evidence and nature of observed changes or their absence. A few chapters provide historical perspective and attempt to present a comprehensive synthesis of the current state of knowledge. Author

**N90-10814\*#** National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

### **CONCEPTUAL DESIGN OF A SYNCHRONOUS MARS TELECOMMUNICATIONS SATELLITE**

DEBORAH M. BADI, JEFFREY T. FARMER, PAUL A. GARN, and GARY L. MARTIN (George Washington Univ., Hampton, VA.) Washington Nov. 1989 18 p

(NASA-TP-2942; L-16580; NAS 1.60:2942) Avail: NTIS HC A03/MF A01 CSCL 03B

COMMAND AND CONTROL, COMMUNICATION SATELLITES, STRUCTURAL DESIGN

**N90-25030\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

### **GEOSCIENCE AND A LUNAR BASE: A COMPREHENSIVE PLAN FOR LUNAR EXPLORATION**

G. JEFFREY TAYLOR, ed. and PAUL D. SPUDIS, ed. (Geological Survey, Flagstaff, AZ.) Washington Apr. 1990 76 p Workshop held in Houston, TX, 25-26 Aug. 1988

(NASA-CP-3070; S-603; NAS 1.55:3070) Avail: NTIS HC A05/MF A01 CSCL 03B

CONFERENCES, GEOLOGY, GEOPHYSICS, LUNAR BASES, LUNAR EXPLORATION, RESOURCES MANAGEMENT

**N90-26744\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

### **FIRST INTERNATIONAL CONFERENCE ON LABORATORY RESEARCH FOR PLANETARY ATMOSPHERES**

KENNETH FOX, ed., JOHN E. ALLEN, JR., ed., LOUIS J. STIEF, ed., and DIANA T. QUILLEN, ed. (Bowie State Univ., MD.) May 1990 481 p Conference held in Bowie, MD, 25-27 Oct. 1989

(NASA-CP-3077; REPT-90B00106; NAS 1.55:3077) Avail: NTIS HC A21/MF A03 CSCL 03B

CHARGED PARTICLES, CONFERENCES, PARTICLE INTERACTIONS, PHOTONS, PLANETARY ATMOSPHERES, REACTION KINETICS, SPECTROSCOPY, THERMODYNAMICS

**N90-27607\*#** Arizona State Univ., Tempe. Dept. of Geology.

### **MARS LANDING SITE CATALOG**

RONALD GREELEY, ed. Washington NASA Aug. 1990 202 p

(NAGW-1306)

(NASA-RP-1238; NAS 1.61:1238) Avail: NTIS HC A10/MF A02 CSCL 03B

The catalog was compiled from material provided by the planetary community for areas on Mars that are of potential interest for future exploration. The catalog has been edited for consistency insofar as practical; however, the proposed scientific objectives and characteristics have not been reviewed. This is a working catalog that is being revised, updated, and expanded continually. Author

## SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

**N87-19328\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**ENERGETIC PHENOMENA ON THE SUN: THE SOLAR MAXIMUM MISSION FLARE WORKSHOP. PROCEEDINGS**  
MUKUL KUNDU, ed. (Maryland Univ., College Park) and BRUCE WOODGATE, ed. Dec. 1986 423 p Workshop held in Greenbelt, Md., 24-28 Jan. 1983, 9-14 Jun. 1983, and 13-17 Feb. 1984 (NASA-CP-2439; NAS 1.55:2439) Avail: NTIS HC A18/MF A03 CSCL 03B

CONFERENCES, MAGNETOHYDRODYNAMIC STABILITY, SOLAR CORONA, SOLAR FLARES, SOLAR MAGNETIC FIELD, SOLAR MAXIMUM MISSION, SOLAR PHYSICS, SOLAR PROMINENCES, SUN, SUNSPOTS

**N87-20871\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**CORONAL AND PROMINENCE PLASMAS**  
ARTHUR I. POLAND, ed. Dec. 1986 435 p Workshop held in Greenbelt, Md., 9-11 Apr. 1985 and 8-10 Apr. 1986 (NASA-CP-2442; REPT-86BO536; NAS 1.55:2442; AD-A188629) Avail: NTIS HC A19/MF A03 CSCL 03/2

CONFERENCES, MAGNETIC FIELD CONFIGURATIONS, MAGNETOHYDRODYNAMIC STABILITY, MAGNETOSTATICS, PLASMAS (PHYSICS), RADIO ASTRONOMY, SOLAR ATMOSPHERE, SOLAR CORONA, SOLAR MAGNETIC FIELD, SOLAR PHYSICS, SOLAR PROMINENCES, SUN

**N87-20947\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**STATISTICAL ASPECTS OF SOLAR FLARES**  
ROBERT M. WILSON Apr. 1987 41 p (NASA-TP-2714; NAS 1.60:2714) Avail: NTIS HC A03/MF A01 CSCL 03B

SOLAR FLARES, SOLAR PROMINENCES, STATISTICAL ANALYSIS

**N87-21785\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**RAPID FLUCTUATIONS IN SOLAR FLARES**  
BRIAN R. DENNIS, ed., LARRY E. ORWIG, ed., and ALAN L. KIPLINGER, ed. (Systems Applied Sciences Corp.-Technologies, Landover, Md.) 1986 491 p Workshop held in Lanham, Md., 30 Sep. - 4 Oct. 1985 (NASA-CP-2449; NAS 1.55:2449) Avail: NTIS HC A21/MF A03 CSCL 03B

CONFERENCES, MICROWAVES, OSCILLATIONS, PLASMA PHYSICS, RADIO WAVES, SOLAR FLARES, X RAYS

**N88-11609\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**THEORETICAL PROBLEMS IN HIGH RESOLUTION SOLAR PHYSICS, 2**  
G. ATHAY, ed. (National Center for Atmospheric Research, Boulder, Colo.) and D. S. SPICER, ed. Sep. 1987 141 p Workshop held in Boulder, Colo., 15-17 Sep. 1986 (NASA-CP-2483; REPT-87B0401; NAS 1.55:2483) Avail: NTIS HC A07/MF A01 CSCL 03B

HIGH RESOLUTION, MAGNETIC FLUX, SOLAR MAGNETIC FIELD, SOLAR OBSERVATORIES, SOLAR PHYSICS

**N89-30151\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**NIMBUS-7 ERB SOLAR ANALYSIS TAPE (ESAT) USER'S GUIDE**  
EUGENE MAJOR, JOHN R. HICKEY, H. LEE KYLE, BRADLEY M. ALTON, and BRENDA J. VALLETTE (Research and Data

Systems, Inc., Lanham, MD.) Nov. 1988 92 p (NASA-RP-1211; REPT-88-204; NAS 1.61:1211) Avail: NTIS HC A05/MF A01 CSCL 03B

Seven years and five months of Nimbus-7 Earth Radiation Budget (ERB) solar data are available on a single ERB Solar Analysis Tape (ESAT). The period covered is November 16, 1978 through March 31, 1986. The Nimbus-7 satellite performs approximately 14 orbits per day and the ERB solar telescope observes the sun once per orbit as the satellite crosses the southern terminator. The solar data were carefully calibrated and screened. Orbital and daily mean values are given for the total solar irradiance plus other spectral intervals (10 solar channels in all). In addition, selected solar activity indicators are included on the ESAT. The ESAT User's Guide is an update of the previous ESAT User's Guide (NASA TM 86143) and includes more detailed information on the solar data calibration, screening procedures, updated solar data plots, and applications to solar variability. Details of the tape format, including source code to access ESAT, are included. Author

**N90-12456\*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

**ON THE STATISTICS OF EL NINO OCCURRENCES AND THE RELATIONSHIP OF EL NINO TO VOLCANIC AND SOLAR/GEOMAGNETIC ACTIVITY**  
ROBERT M. WILSON Washington Sep. 1989 62 p (NASA-TP-2948; NAS 1.60:2948) Avail: NTIS HC A04/MF A01 CSCL 03B

AIR WATER INTERACTIONS, EL NINO, GEOMAGNETISM, SOLAR TERRESTRIAL INTERACTIONS, VOLCANOES

## SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts.

**N87-25984\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

**COSMIC RAY HEAVY ION LET MAPPING FOR ALUMINUM, SILICON, AND TISSUE TARGETS**  
E. G. STASSINOPOULOS, J. M. BARTH, and T. M. JORDAN (EMP Consultants, Northridge, Calif.) Apr. 1987 264 p (NASA-RP-1180; REPT-87B0034; NAS 1.61:1180) Avail: NTIS HC A12/MF A02 CSCL 03B

Linear energy transfer (LET) values in aluminum, silicon, and tissue targets have been calculated for 31 galactic cosmic ray ion species in eight different units. The values are described for single event upset (SEU) effect assessments or radiobiological evaluations. The data are presented in graphical and tabular form. Author

**N89-14210\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**SOLAR-FLARE SHIELDING WITH REGOLITH AT A LUNAR-BASE SITE**  
JOHN E. NEALY, JOHN W. WILSON, and LAWRENCE W. TOWNSEND Dec. 1988 21 p (NASA-TP-2869; L-16488; NAS 1.60:2869) Avail: NTIS HC A03/MF A01 CSCL 03B

LUNAR BASES, LUNAR SURFACE, RADIATION DOSAGE, RADIATION SHIELDING, SOLAR FLARES

**N89-16714\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**BENCHMARK SOLUTIONS FOR THE GALACTIC ION TRANSPORT EQUATIONS: ENERGY AND SPATIALLY DEPENDENT PROBLEMS**  
BARRY D. GANAPOL (Arizona Univ., Tucson), LAWRENCE W.

## 93 SPACE RADIATION

TOWNSEND, and JOHN W. WILSON Washington, DC Mar. 1989 31 p  
(NASA-TP-2878; L-16519; NAS 1.60:2878) Avail: NTIS HC  
A03/MF A01 CSCL 03B

EQUATIONS OF MOTION, GALACTIC RADIATION, HEAVY IONS, ION BEAMS, IONIC MOBILITY, RADIATION HAZARDS, TRANSPORT THEORY

**N89-17562\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **BRYNTRN: A BARYON TRANSPORT MODEL**

JOHN W. WILSON, LAWRENCE W. TOWNSEND, JOHN E. NEALY, SANG Y. CHUN, B. S. HONG, WARREN W. BUCK, S. L. LAMKIN, BARRY D. GANAPOL, FERDOUS KHAN, and FRANCIS A. CUCINOTTA (Old Dominion Univ., Norfolk, VA.) Washington, DC Mar. 1989 84 p

(NASA-TP-2887; L-16512; NAS 1.60:2887) Avail: NTIS HC  
A05/MF A01 CSCL 03B

BARYONS, COMPUTER PROGRAMS, DATA BASES, ENERGY TRANSFER, TRANSPORT PROPERTIES

**N89-25103\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **KAON-NUCLEUS SCATTERING**

BYUNGSIK HONG, KHIN MAUNG MAUNG, JOHN W. WILSON, and WARREN W. BUCK (Hampton Inst., VA.) 1989 30 p

(NASA-TP-2920; L-16583; NAS 1.60:2920) Avail: NTIS HC  
A03/MF A01 CSCL 03A

ABSORPTION CROSS SECTIONS, EIKONAL EQUATION, KAONS, MESON-NUCLEON INTERACTIONS, NUCLEAR SCATTERING, NUCLEONS, PARTICLE COLLISIONS, PARTICLE INTERACTIONS, PROTON SCATTERING, SCATTERING CROSS SECTIONS, SCHROEDINGER EQUATION

**N90-18357\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **RADIATION EXPOSURE FOR MANNED MARS SURFACE MISSIONS**

LISA C. SIMONSEN, JOHN E. NEALY, LAWRENCE W. TOWNSEND, and JOHN W. WILSON Washington Mar. 1990 25 p

(NASA-TP-2979; L-16708; NAS 1.60:2979) Avail: NTIS HC  
A03/MF A01 CSCL 03B

GALACTIC COSMIC RAYS, MANNED MARS MISSIONS, MARS ATMOSPHERE, MARS SURFACE, RADIATION DOSAGE, SOLAR FLARES

**N90-25031\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **IMPROVED MODEL FOR SOLAR COSMIC RAY EXPOSURE IN MANNED EARTH ORBITAL FLIGHTS**

JOHN W. WILSON, JOHN E. NEALY, WILLIAM ATWELL, FRANCIS A. CUCINOTTA (Rockwell International Corp., Houston, TX.), JUDY L. SHINN, and LAWRENCE W. TOWNSEND Washington Jun. 1990 14 p

(NASA-TP-2987; L-16759; NAS 1.60:2987) Avail: NTIS HC  
A03/MF A01 CSCL 03B

ASTRONAUTS, EXPOSURE, FLUENCE, MATHEMATICAL MODELS, ORGANS, RADIATION DOSAGE, RADIATION SHIELDING, SOLAR COSMIC RAYS

**N90-29290\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **COMPARISON OF DOSE ESTIMATES USING THE BUILDUP-FACTOR METHOD AND A BARYON TRANSPORT CODE (BRYNTRN) WITH MONTE CARLO RESULTS**

JUDY L. SHINN, JOHN W. WILSON, JOHN E. NEALY, and FRANCIS A. CUCINOTTA (Rockwell International Corp., Houston, TX.) Washington Oct. 1990 29 p

(NASA-TP-3021; L-16806; NAS 1.60:3021) Avail: NTIS HC  
A03/MF A01 CSCL 03B

COMPUTER PROGRAMS, EXTRATERRESTRIAL RADIATION,

MONTE CARLO METHOD, RADIATION DOSAGE, RADIATION SHIELDING, RADIATION TRANSPORT

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## GENERAL

**N87-24390\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

### **ENGINEER IN CHARGE: A HISTORY OF THE LANGLEY AERONAUTICAL LABORATORY, 1917-1958**

JAMES R. HANSEN (Maine Univ., Orono.) Washington, D.C. 1986 643 p NASA History Series

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(NASA-SP-4305; NAS 1.21:4305) Avail: SOD HC \$30.00 as  
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**N88-14062\*#** National Aeronautics and Space Administration, Washington, DC.

### **ASTRONAUTICS AND AERONAUTICS, 1978: A CHRONOLOGY**

BETTE R. J'ANSON (Creative Resources and Planning, Fairfax, Va.) 1986 394 p *Its* NASA History Series

(NASA ORDER W-73289)

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This is the 18th in a series of annual chronologies of significant events in the fields of astronautics and aeronautics. Events covered are international as well as national and political as well as scientific and technical. This series is a reference work for historians, NASA personnel, government agencies, congressional staffs, and the media. Author

**N88-25428\*#** National Aeronautics and Space Administration, Washington, DC.

### **NASA HISTORICAL DATA BOOK. VOLUME 1: NASA RESOURCE 1958-1968**

JANE VANNIMMEN, LEONARD C. BRUNO, and ROBERT L. ROSHOLT 1988 639 p

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**N88-25429\*#** National Aeronautics and Space Administration, Washington, DC.

### **NASA HISTORICAL DATA BOOK. VOLUME 2: PROGRAMS AND PROJECTS 1958-1968**

LINDA NEUMAN EZELL 1988 652 p

(NASW-3597)

(NASA-SP-4012-VOL-2; NAS 1.21:4012-VOL-2; LC-74-600126)

Avail: NTIS MF A04; SOD HC \$57.00 in set of 3 as

033-000-01017-6 CSCL 05D

This is Volume 2, Programs and Projects 1958-1968, of a three-volume series providing a 20-year compilation of summary statistical and other data descriptive of NASA's programs in

aeronautics and manned and unmanned spaceflight. This series is an important component of NASA published historical reference works, used by NASA personnel, managers, external researchers, and other government agencies. Author

**N88-25430\*#** National Aeronautics and Space Administration, Washington, DC.

**NASA HISTORICAL DATA BOOK. VOLUME 3: PROGRAMS AND PROJECTS 1969-1978**

LINDA NEUMAN EZELL 1988 492 p  
(NASW-3597)  
(NASA-SP-4012-VOL-3; NAS 1.21:4012-VOL-3; LC-74-600126)  
Avail: NTIS MF A03; SOD HC \$57.00 in set of 3 as  
033-000-01017-6 CSDL 05D

This is Volume 3, Programs and Projects 1969-1978, of a three-volume series providing a 20-year compilation of summary statistical and other data descriptive of NASA's programs in aeronautics and manned and unmanned spaceflight. This series is an important component of NASA published historical reference works, used by NASA personnel, managers, external researchers, and other government agencies. Author

**N89-25946\*#** National Aeronautics and Space Administration, Washington, DC.

**WHERE NO MAN HAS GONE BEFORE: A HISTORY OF APOLLO LUNAR EXPLORATION MISSIONS**

WILLIAM DAVID COMPTON 1988 420 p Original contains color illustrations  
(NASA-SP-4214; NAS 1.21:4214) Avail: NTIS HC A18/MF A03  
CSDL 05D

This book is a narrative account of the development of the science program for the Apollo lunar landing missions. It focuses on the interaction between scientific interests and operational considerations in such matters as landing site selection and training of crews, quarantine and back contamination control, and presentation of results from scientific investigations. Scientific exploration of the moon on later flights, Apollo 12 through Apollo 17 is emphasized. Author

**N89-26803\*#** National Aeronautics and Space Administration, Washington, DC.

**ASTRONAUTICS AND AERONAUTICS, 1985: A CHRONOLOGY**

BETTE R. JANSON Mar. 1988 545 p  
(NASA-SP-4025; NAS 1.21:4025; LC-65-60308) Avail: NTIS HC A23/MF A03; also available SOD HC \$22.00 as 033-000-01022-2  
CSDL 05B

This book is part of a series of annual chronologies of significant events in the fields of astronautics and aeronautics. Events covered are international as well as national, in political as well as scientific and technical areas. This series is an important reference work used by historians, NASA personnel, government agencies, and congressional staffs, as well as the media. Author

**N89-26805\*#** National Aeronautics and Space Administration, Washington, DC.

**ORDERS OF MAGNITUDE: A HISTORY OF THE NACA AND NASA, 1915-1990**

ROGER E. BILSTEIN Jul. 1989 171 p ERRATUM: Coauthored by Frank W. Anderson, Jr.  
(NASA-SP-4406; NAS 1.21:4406) Avail: NTIS HC A08/MF A01  
CSDL 05D

This edition brings up to date the history of U.S. agencies for space exploration, the NACA and NASA, from 1915 through 1990. Early aviation and aeronautics research are described, with particular emphasis on the impact of the two world wars on aeronautics development and the postwar exploitation of those technologies. The reorganization and expansion of the NACA into NASA is described in detail as well as NASA's relationship with industry, the university system, and international space agencies such as the ESA. The dramatic space race of the 1950 and 1960s is recounted through a detailed history of the Gemini and Apollo programs and followed by a discussion of the many valuable social/scientific application of aeronautics technologies, many of

which were realized through the launching of successful satellite projects. The further solar system explorations of the Voyager missions are described, as is the Challenger tragedy and the 1988 return to space of the Shuttle program. Future plans are outlined for a cooperatively funded international space station to foster the ongoing study of space science. Author

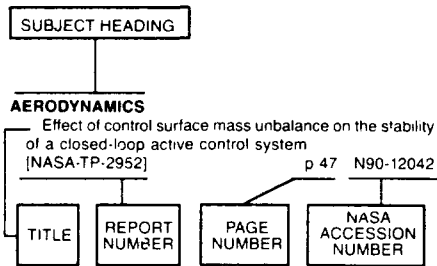
**N90-25928\*#** National Aeronautics and Space Administration, Washington, DC.

**ASTRONAUTICS AND AERONAUTICS, 1979-1984: A CHRONOLOGY**

BETTE R. JANSON and ELEANOR H. RITCHIE Nov. 1989  
736 p  
(NASA-SP-4024; NAS 1.21:4024) Avail: NTIS HC A99/MF A04; also available SOD HC \$24.00 as 033-000-01080-0 CSDL 05D

This volume of the Astronautics and Aeronautics series covers 1979 through 1984. The series provides a chronological presentation of all significant events and developments in space exploration and the administration of the space program during the period covered. Author

## Typical Subject Index Listing



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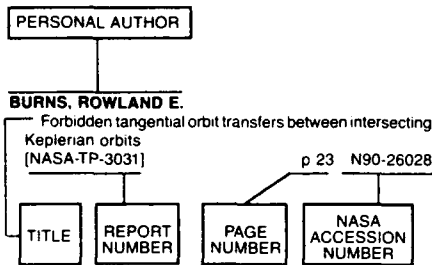
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